UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 8, August 2017

# Diversity of Intramural Aeromycobiota of the Rice Godown of Rice Mill

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**Abstract:** Present investigation lead to know about the diversity of intramural aeromycobiota of Rice Godown of a rice mill situated in Desaiganj, the place located in the Gadchiroli district of Maharashtra state. During the present study a total count of 597 fungal colonies comprises of 28 species and 13 genera were isolated over CzA media. Deuteromycotina was found to be the dominant one followed by Ascomycotina and the maximum number of species was found to be of Deuteromycotina. Aspergillus was dominated with the frequency of 34% followed by Alternaria and Fusarium. Simpson's (1-D) diversity index was found to be 0.9605 and the Shanon (H') diversity index was found to be 3.279.

**Keywords:** Intramural, Aeromycoflora, Rice mill, Godown, Aspergillus, Alternaria.

## I. INTRODUCTION

Rice mill presence indicates the healthy and good production of rice in that particular area. There are several Rice mills located in the Desaiganj as it belongs to one of the leading district of Rice production in Maharashtra i.e. Gadchiroli. Godown is basically a store house where one can keep their goods or something materials for a certain amount of time as a storage purpose. In the Rice mill different types of Godowns are there where different materials were stored at different conditions like the Paddy Rice, which were brought by the farmers from field, the processed rice, the small tiny particles of Rice collected during rice production and many more product produced during the rice production. This study is focused only on the Rice Godown where processed rice was stored. Intramural aeromycoflora was found to responsible for discoloration or deterioration or degradation of cellulosic materials [10, 5] which ultimately lead to loss of stored rice.

Cellulosic materials, moisture, humidity and various gases present in the godowns are responsible to increase the concentration of indoor aeromycoflora [7]. The ambient temperature and humidity present in the godown is important character which leads to increase the intramural Aeromycobiota [5]. Although the fungal spores present in the environment are important part of it but they are acting as a bio-pollutant also [1, 17].

Several investigations were carried out with respect to the intramural aeromycobiota. Fungi present in the intramural environment act as scavengers and they lead to the biodeterioration and discoloration of food grains [12, 4]. They are also responsible to cause several respiratory and skin diseases to human being [3]. So it is the prime need to regularly monitor and study the intramural aeromycoflora of godowns to prevent the losses of food grains which will be caused by fungi.

## II. MATERIALS AND METHODS

For the present study following methodology were implemented

1. **Sampling site**: The Rice mill godown of the Sai rice mill (20°37'12.39"N 79°57'55.37" E) Desaiganj (Wadasa) was selected as a sampling site as it is one of leading rice mill of the Gadchiroli district. Gadchiroli district is one of the leading district of Maharashtra in rice production [16].

2. **Culture Medium**: Czapek's Dox Agar (CzA) was used to isolate the intramural aeromycobiota. The medium was prepared by using $FeSO_4.7H_2O$ 0.1 gm/l, KCl 0.5 gm/l, $KH_2PO_4$ gm/l, $MgSO_4.7H_2O$ 0.5 gm/l, $NaNO_3$ 2 gm/l, Sucrose 30 gm/l and Agar 20 gm/l. The prepared medium was poured into the petri plates aseptically when its temperature slightly cooled down and let that petri plate to jellify.

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3. **Spore sampling**: Petri plates containing sterilized CzA were exposed in the Godown in triplicates for 5 to 10 minutes. After exposer they were sealed with parafilm and brought into laboratory. Petri plates were incubated at 26$^{o}$C±2 for 5-6 days.

4. **Identification of Fungi:** Fungal colonies appeared on the medium were further identified. Fungus from the colony was picked up with needle and a slide was prepared using lacto phenol cotton blue stain and observed under microscope and identified by using standard literature like Illustrated Genera of Imperfect Fungi [2], A Manual of Aspergilli [13], Pictorial Atlas of Soil and Seed Fungi [15].

5. **Data analysis:** The isolated fungal colony count were noted in the form of tabulated data and were further analyses for frequency, Shannon Diversity Index and Simpson Diversity Index by using following formulas.

$$\text{Frequency} = \frac{\text{Number of individual colony}}{\text{Total number of all fugal colonies}} \times 100$$

$$\text{Shannon index } (H') = -\sum_{i=1}^{R} Pi \ln Pi$$

$$\textbf{Simpson's Index}(D) = \frac{\sum n(n-1)}{N(N-1)}$$

## III. RESULT AND DISCUSSIONS

The present study reveals the highly dominance of fungal spores in the intramural environment of godown of rice mill. The heavy load of spore count of intramural aeromycobiota in godown is receiving the attention of researcher with reference to the losses caused by the fungal spore and the health hazards caused to the human beings. In the present study intramural aeromycobiota was analyzed for quantitative and qualitative parameters. The present study reveals that the altogether a total of 28 fungal species comprises under 13 genera were found to be present inside the godown during sampling period (Table 1).

Intramural aeromycobiota was isolated by the petri plate exposer method which was also followed by the Lanjewar and Sharma 2014 [7]; Reddy et al., 2012 [10]. This method was found to be more appropriate than others and this result was also supported by the findings of Kayarkar and Bhajbhuje, 2014 [6]; Verma et al., 2013 [14]; Lanjewar and Sharma 2014 [7] who reported the maximum fungal colony count as well as greater fungal diversity of intramural aeromycobiota by petri plate exposure test.

A count of total 597 fungal colonies was isolated over the CzA during the sampling period. Deuteromycotina was dominated with the frequency of 42.38% followed by the Ascomycotina (40.54%). Zygomycotina contribute its little presence in intramural aeromycobiota with only 8.88% (Table 1, Fig. 1). Prevalence of Deuteromycotina was found to be with the 10 species comprises of 7 genera (Fig. 2). Alternaria was the dominating one (11.2%) in this group and showed its presence with 2 species i.e. Alternaria alternata and Alternaria tenuissima. Curvularia and Fusarium contribute nearly at same frequency i.e. 8% and with 2 species each i.e. Curvularia brachyspora, Curvularia lunata, Fusarium monoliformae, Fusarium oxysporum. Bipolaris, Nigrospora, Pithomyces, Torula contribute in the range of 2-5% (Table 1).

Deuteromycetous fungi have thick walled conidia which can sustain in the any environment [5]. Fungi are found to secret many toxins. Alternaria alternata found to secret Alternariol monomethylether, Tenuazoic acid and Altertoxins which can cause diseases like skin diseases, respiratory and skin diseases [11] and also micro-mutation is found to be induced in different groups of animals by Alternaria toxin [3].

Curvularia and Fusarium were also found to be responsible for many human diseases. Fusarium is found to break down carpets, mattresses, damp walls, polyester, and produce a different mycotoxins including Trichothecenes (T-2 toxin, HT-2 toxin, deoxy-nivalenol and nivalenol), Zearalenon and Fumonisins, many of which have responsible for the cause of human health problems [9].

Population of altogether 242 fungal colonies of Ascomycotina was reported during sampling period which was confined to only two genera but 13 different species (Table-1, Fig. 1, Fig. 2). Aspergillus was found to dominating one with the frequency of 34% followed by the Penicillium 6.53%. Among the Aspergillus, Aspergillus niger (5%) was dominated followed by the Aspergillus japonicus, Aspergillus oryzae, Aspergillus flavus which contribute nearly same (4%). All other remaining 7 species like contribute at 1-3% in the intramural aeromycobiota (Table- 1).

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The presence of Zygomycotina was reported at the frequency of 8.88%. 3 species confined to 2 genera were reported in this group. Mucor pucillus (2%), Rhizopus stolonifer (3%) and Rhizopus microsporus (3%) were the only members reported (Table-1). Mucorales were known to cause a common disorder mucormycosis which was reported to cause health problems for 70-80% human population [8].

Black sterile mycelium and White sterile mycelium was also reported at the frequency of 5% and 2% respectively. Simpson's (1-D) diversity index was found to be 0.9605 and the Shanon (H') diversity index was found to be 3.279.

Table-1 Intramural Aeromycobiota of Rice Godown of Desaiganj (MS)

| Sr. No. | Fungal organism | Total colony | Frequency | |
|---|---|---|---|---|
| | | | Species | Genera |
| **A.** | **Zygomycotina** | **53** | **8.88** | **8.88** |
| 1 | Mucor pucillus | 15 | 2.51 | 2.51 |
| 2 | Rhizopus microsporus | 18 | 3.02 | 6.37 |
| 3 | Rhizopus stolonifer | 20 | 3.35 | |
| **C.** | **Ascomycotina** | **242** | **40.54** | **40.54** |
| 4 | Aspergillus candidus | 10 | 1.68 | 34.00 |
| 5 | A. flavus | 22 | 3.69 | |
| 6 | A. fumigatus | 11 | 1.84 | |
| 7 | A. japonicus | 25 | 4.19 | |
| 8 | A. niger | 35 | 5.86 | |
| 9 | A. ochraceus | 14 | 2.35 | |
| 10 | A. oryzae | 26 | 4.36 | |
| 11 | A. phoenicis | 17 | 2.85 | |
| 12 | A. sulphureus | 13 | 2.18 | |
| 13 | A. versicolor | 16 | 2.68 | |
| 14 | A. wentii | 14 | 2.35 | |
| 15 | Penicillium citrinum | 19 | 3.18 | 6.53 |
| 16 | P. oxalicum | 20 | 3.35 | |
| | | | | |
| **E.** | **Deuteromycotina** | **253** | **42.38** | **42.38** |
| 18 | Alterneria alternata | 33 | 5.53 | 11.22 |
| 19 | Alternaria tenuissima | 34 | 5.70 | |
| 20 | Bipolaris tetramera | 30 | 5.03 | 5.03 |
| 21 | Curvularia brachyspora | 26 | 4.36 | 8.38 |
| 22 | Curvularia lunata | 24 | 4.02 | |
| 23 | Fusarium monoliformae | 25 | 4.19 | 8.04 |
| 24 | Fusarium oxysporum | 23 | 3.85 | |
| 25 | Nigrospora oryzae | 22 | 3.69 | 3.69 |
| 26 | Pithomyces maydicus | 15 | 2.51 | 2.51 |
| 27 | Torula herbarum | 21 | 3.52 | 3.52 |
| | **Other Type** | **49** | **8.21** | **8.21** |
| 28 | Black sterile mycelium | 33 | 5.53 | 5.53 |
| 29 | White sterile mycelium | 16 | 2.68 | 2.68 |
| | **Total** | **597** | 100 | 100 |

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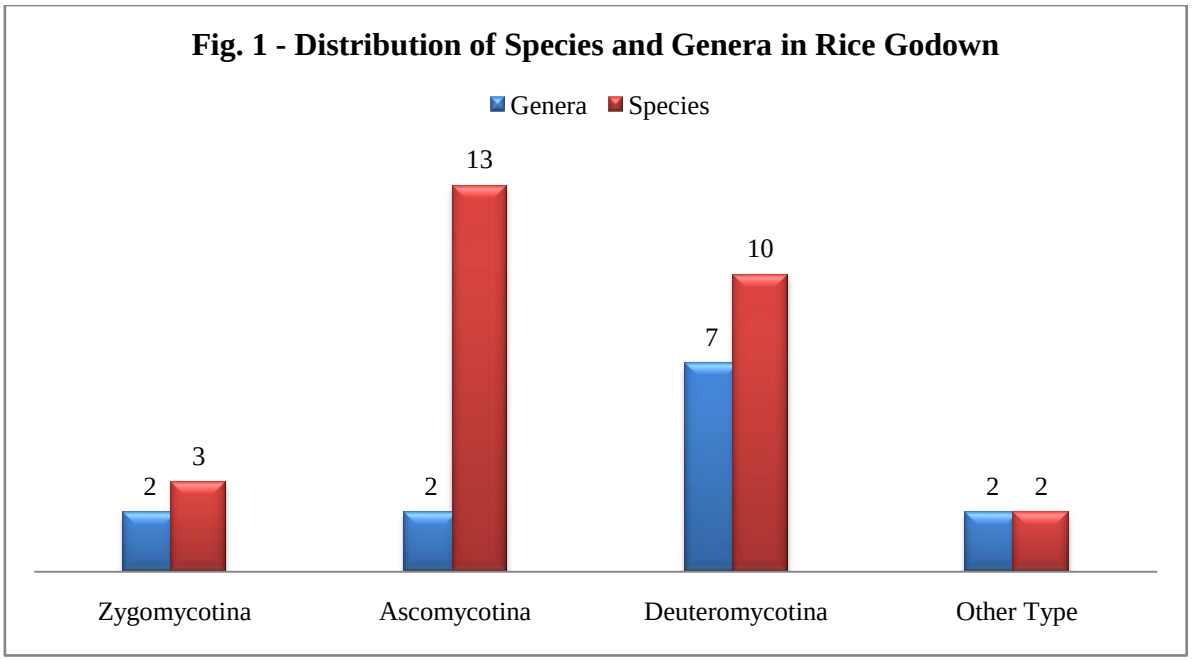


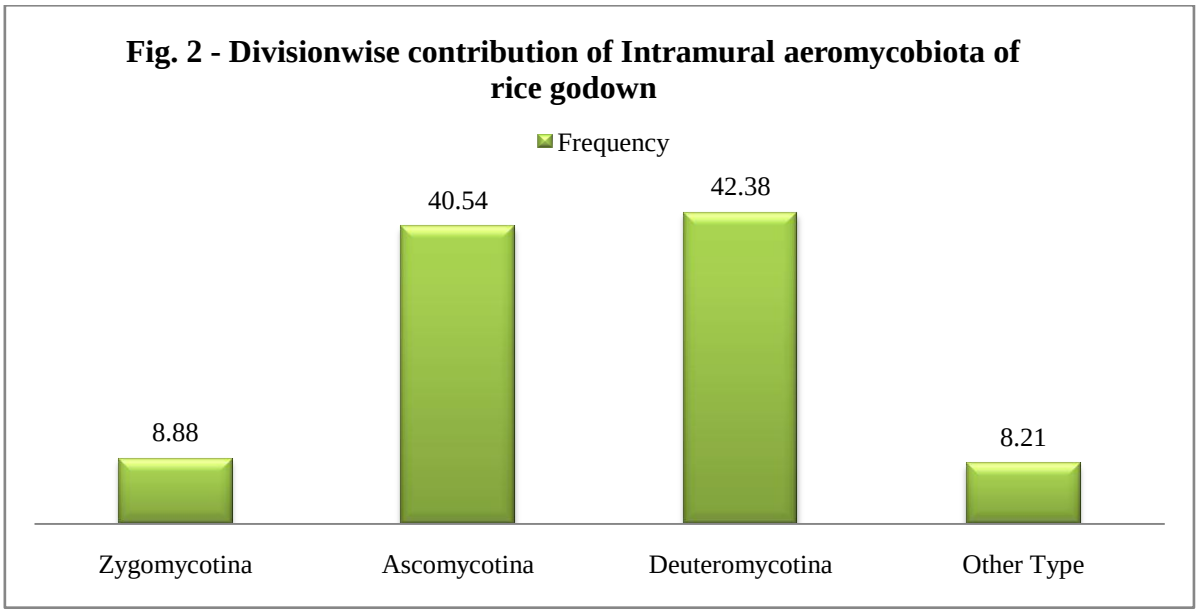


## IV. CONCLUSIONS

Diversity of intramural aeromycoflora of Rice Godown was reported with the 597 fungal colonies which was harbor by the 28 species confined to 13 genera. Deuteromycotina was found to be dominated followed by the Ascomycotina and Zygomycotina. Alternaria, Curvularia, Fusarium, Aspergillus, Penicillium were found to be dominating fungi isolated over CzA through Petri Plate method. Simpson's (1-D) diversity index was found to be 0.9605 and the Shanon (H') diversity index was found to be 3.279.

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ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

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