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ISOLATION OF AEROMYCOFLORA OF COLD STORAGE AT RAIPUR (C.G)



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A B S T R A C T

Cold storage is mainly used for storage of vegetable, fruits and milk products. These products can be easily store in 2 to 4 °C for long term. Fungi are diverse group of organisms and have been found in large amount in the environment. Present paper deals with the aeromycoflora of cold storage of Raipur (C.G.). During the present investigation 226 fungal colonies and 35 fungal species were observed. The percentage contribution of different classes was as follows, Zygomycotina (5.75%), Ascomycotina (0.88%), Deuteromycotina (83.62%), Unknown fungi (8.84%) and Mycelia sterilia (0.88%). Out of total fungal population Penicillium sp. ÉÉ (13.71%) was most dominated whereas, Cladosporium cladosporioides (7.96%), Aspergillus niger and Aspergillus versicolor (7.52%) were co-dominant fungal species.

INTRODUCTION

Microorganisms always present in the nature and they migrate through one place to another by air current. Fungus is the common microorganisms in our environment, and always present in form of spores. It can grow at temperature as low as 2 to 4°C and can infect surrounding fruits and vegetables during storage. They often precipitate on the stored materials from the field, after which they can grow sporulate and spread through batches of stored fruits and vegetables in the presence of suitable temperature and substrate. Fruits and vegetables are additional source of vitamins, minerals and sugars for human beings. Storage area may also become contaminated with airborne fungal spores. Cold storage can keep fruits and vegetables in good condition for after the growing season. Some fruits, vegetable and milk products must be stored at 2 to 4 °C. Most fruits and vegetables need relative humidity, storage to be kept between 85 - 95 %, low temperatures increases the storage life of fruits, vegetable and milk products Cold storage

helps in maintain fruits and vegetables fresh and prevent them for decaying. Microorganism grows at optimum temperature 28 ± 1 °C but low temperature is not suitable for growth of microorganism.

MATERIALS AND METHODS

The gravity petriplate exposure method was used for the trapping of fungal spores using PDA (Potato Dextrose Agar) media at fortnightly intervals. Three petri plates were exposed for 5 to 10 min. in cold storage. The exposed petriplates were brought to laboratory and incubated at 28 ± 1 °C for 6 to 8 days.

RESULTS AND DISCUSSIONS

During the investigation period total 226 fungal colonies belonging to 35 species from 19 genera are observed. Out of which 03 fungal species (13 fungal colonies) belongs to Zygomycotina, 01 fungal species (02 colonies) from Ascomycotina, 28 fungal species (189 colonies) from Anamorphic fungi, 02 fungal species (19 fungal colonies) belongs to Unknown fungi and 01 fungal species

(02 fungal colonies) belongs to Mycelia sterilia. (Table-1) The member of Basidiomycotina was totally absent during the study period. The class wise percentage contribution recorded was as follows, Zygomycotina (5.75%), Ascomycotina (0.88%), Anamorphic fungi (83.62%), Unknown fungi (8.84%) and Mycelia sterilia (0.88%) were recorded whereas the member of Basidiomycotina was totally absent. In the summer season, a total 15 fungal species (46 colonies) from 10 genera are observed. Out of which 14 fungal species (42 fungal colonies) from Anamorphic fungi, 01 fungal species (04 fungal colonies) from *Unidentified* sp. In rainy season a total number of 21 fungal species 72 colonies belong to 14 genera are recorded. Among them 03 fungal species (11 fungal colonies) belong to group Zygomycotina, 16 fungal species (55 fungal colonies) form Anamorphic fungi, 01 fungal species (04 fungal colonies) from *Unidentified* sp. II. 01 fungal species (02 fungal colonies) from Mycelia sterilia are recorded.

During the winter season, a total 23 fungal species (108 fungal colonies) belongs to 13 genera are recorded. Out of which 01 fungal species (02 fungal colonies) belongs to Zygomycotina, 01 species (02 fungal colonies) belongs to Ascomycotina, 19 species (92 fungal colonies) belong to Anamorphic fungi and 01 fungal species (11 fungal colonies) from *Unidentified* sp. II are recorded. Percentage frequency and percentage contribution were also observed during investigation period. In summer season, maximum percentage contribution is made by *Penicillium rubrum* (32.55%) and *P. purpurogenum* (17.36 %) while minimum percentage contribution was made by *Alternaria alternata*, *Aspergillus flavus*, *A. luchensis*, *A. sulphureus*, *Curvularia lunata*, *Drechslera australiansis* and *Paecilomyces varioti* (2.17%) and moderate by *Aspergillus versicolor* and *A. fumigatus* (6.52%), *Trichoderma viride* (6.51%) and *Unidentified* sp. II (8.68 %). (Table – 2) During rainy season, maximum percentage contribution made by *Aspergillus flavus* (19.44 %) whereas minimum *Mucor* sp., *Syncephalastrum racemosum*, *Alternaria alternata*, *Aspergillus nidulans*, *Cladosporium cladosporioides*, *Curvularia lunata*,

Paecilomyces varioti and *Trichoderma* sp. I (1.38 %) while moderate contribution showed by *Aspergillus niger* (15.18 %) and *A. versicolor* (6.9%). (Table – 2)

In winter season, maximum percentage contribution was made by *Penicillium* sp. II (28.70%) while minimum percentage contribution was made by *Alternaria chlamydospora*, *Curvularia lunata*, *Cladosporium sphaerospermum*, *Diplococcium* sp., *Fusarium oxysporum*, *Penicillium* sp. I and *Phoma* sp. (0.92 %). Some fungal species were most frequent during investigation period i.e. *Aspergillus niger* and *A. versicolor* (58.88%). Tiwari *et al.* (2005) have also reported *Aspergillus niger* was most frequent fungal species during the investigation period. (Table – 2)

Aspergillus fumigatus, *Alternaria alternata* and *Aspergillus versicolor* present all season during investigation period. Some fungal species was present more than one season but not in all season i.e. *Fusarium oxysporum* and *Aspergillus flavus* present in rainy season and winter season, *Drechslera australiansis* summer and winter season while *Penicillium rubrum* was present only in summer season. Certain fungal species observed only particular in a month i.e. *Aspergillus sulphureus*, *Verticillium* sp. Present in May month, *Phoma* sp. in January month and Mycelia sterilia present in July and October month only. *Aspergillus* and *Penicillium* were the most dominant fungal species in the environment of cold storage. Similar result was also recorded by (Li-De-Wei and Kendrick 1995; Ismail *et al.* 1999; Cvetnic and Pepeljnjak 2001; Singh and Rakhi 2003; Majumdar and Barui 2007). *Aspergillus* sp. was observed throughout the study period similar result was also reported by Tiwari *et al.* (2006). Anamorphic fungi recorded as the most contributed fungal group throughout the study period similar result also recorded by (Jadhav and Tiwari 1994; Tiwari *et al.* 2005 and 2006). During the investigation period, it was also observed that the maximum contributed fungal species of cold storage were *Penicillium* sp. II (13.71%), *Cladosporium cladosporioides* (7.96%) and *Aspergillus niger* and *A. versicolor* (7.52%).

TABLE – 1 : SHOWING PERCENTAGE CONTRIBUTION OF DIFFERENT FUNGAL SPECIES FROM COLD STORAGE

S.No.	Name of fungi	SUMMER SEASON				Total	WINTER SEASON				Total	SUMMER SEASON				Total	Annual % Contri.
		M	A	M	J		J	A	S	O		N	D	J	F		
Zygomycotina																	
1.	<i>Mucor</i> sp.	-	-	-	-	-	-	-	4.76	-	-	-	-	-	5.00	1.85	1.32
2.	<i>Rhizopus</i> sp.	-	-	-	-	16.66	17.64	23.80	-	-	-	-	-	-	-	-	3.98
3.	<i>Syncephalastrum racemosum</i>	-	-	-	-	16.66	-	-	-	-	-	-	-	-	-	-	0.44
Ascomycotina																	
4.	<i>Chaetomium globosum</i>	-	-	-	-	-	-	-	-	-	2.70	4.76	-	-	1.85	0.88	
Anamorphic fungi																	
5.	<i>Alternaria alternata</i>	-	-	7.69	-	2.17	-	-	3.57	1.58	2.70	-	-	2.50	1.85	1.76	
6.	<i>Alternaria chlamydospora</i>	-	-	-	-	-	-	-	-	-	-	-	10.00	-	0.92	0.44	
7.	<i>Aspergillus flavus</i>	-	9.09	-	-	2.17	-	35.29	23.80	10.71	19.44	-	-	2.50	0.92	7.07	
8.	<i>Aspergillus fumigatus</i>	28.57	9.09	-	-	6.52	-	5.88	4.76	3.57	4.16	-	-	17.50	6.48	5.75	
9.	<i>Aspergillus luchensis</i>	-	-	7.69	-	2.17	-	-	-	-	-	-	-	-	-	0.44	
10.	<i>Aspergillus nidulans</i>	-	-	-	-	-	-	-	3.57	1.38	-	-	-	-	-	0.44	
11.	<i>Aspergillus niger</i>	-	-	-	20.00	6.52	16.66	11.62	14.28	17.85	15.18	2.70	-	10.00	10.00	5.55	7.52
12.	<i>Aspergillus sulphureus</i>	-	9.09	7.69	-	4.34	-	-	-	-	-	-	-	-	-	-	0.44
13.	<i>Aspergillus terreus</i>	-	-	-	-	-	-	11.62	4.76	3.57	5.52	-	-	2.50	0.92	2.21	
14.	<i>Aspergillus versicolor</i>	-	-	-	-	-	16.66	5.88	-	10.71	6.9	10.81	19.04	10.00	-	8.33	7.52
15.	<i>Cladosporium cladosporioides</i>	-	-	-	-	-	16.66	-	-	-	1.38	8.10	52.38	-	2.50	13.88	7.96
16.	<i>Cladosporium sphaerospermum</i>	-	-	-	-	-	-	-	-	-	-	-	4.76	-	-	0.92	0.44
17.	<i>Curvularia lanata</i>	-	-	7.69	-	2.17	-	-	-	3.57	1.38	-	4.76	-	-	0.92	1.32
18.	<i>Diplococcium</i> sp.	-	-	-	-	-	-	-	-	-	-	-	-	10.00	-	0.92	0.44
19.	<i>Drechslera australiensis</i>	-	-	7.69	-	2.17	-	-	-	-	-	-	-	10.00	-	0.92	0.88
20.	<i>Fusarium moniliforme</i>	-	-	-	-	-	-	-	-	-	-	2.70	4.76	10.00	-	2.77	1.32
21.	<i>Fusarium oxysporum</i>	-	-	-	-	-	-	-	9.52	3.57	4.14	2.70	-	-	-	0.92	1.76
22.	<i>Monilia</i> sp.	-	-	-	-	-	-	5.88	-	7.14	4.14	-	-	-	-	-	1.32
23.	<i>Paeciliomyces varioti</i>	14.28	-	-	-	2.17	-	5.88	-	-	1.38	-	-	-	-	-	0.88
24.	<i>Penicillium notatum</i>	-	-	-	-	-	-	-	9.52	-	2.76	-	-	-	-	-	0.88
25.	<i>Penicillium purpurogenum</i>	-	18.18	-	40.00	17.36	-	-	4.76	3.57	2.76	-	-	5.00	1.85	5.30	
26.	<i>Penicillium rubrum</i>	42.85	45.45	23.07	26.66	32.55	-	-	-	-	-	-	-	-	-	-	6.63
27.	<i>Penicillium</i> sp. (I)	-	-	-	-	-	-	-	-	-	-	-	4.76	-	-	0.92	0.44
28.	<i>Penicillium</i> sp. (II)	-	-	-	-	-	-	-	-	-	-	37.83	-	42.50	28.70	13.71	
29.	<i>Phoma</i> sp.	-	-	-	-	-	-	-	-	-	-	-	-	10.00	-	0.92	0.44
30.	<i>Trichoerema viride</i>	14.28	-	-	13.33	6.51	-	-	-	7.14	2.76	-	-	30.00	10.00	6.48	5.30
31.	<i>Trichoderma</i> sp.	-	-	-	-	-	-	-	-	3.57	1.38	-	-	-	-	-	0.44
32.	<i>Verticillium</i> sp.	-	-	7.69	-	2.17	-	-	-	-	-	-	-	-	-	-	0.44
Unidentified fungi																	
33.	Unidentified sp.(I)	-	-	-	-	-	-	-	-	14.28	5.52	-	-	10.00	-	0.92	2.21
34.	Unidentified sp. (II)	-	9.09	23.07	-	8.68	-	-	-	-	-	-	29.72	-	-	10.18	6.63
Mycelia sterilia																	
35.	Mycelia sterilia	-	-	-	-	-	16.66	-	-	3.57	2.76	-	-	-	-	-	0.88

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