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RESEARCH ARTICLE

AEROMYCOLOGICAL SURVEY OF A VEGETABLE MARKET IN AMBIKAPUR CITY

***[1]Shanthamma, J. and [2]Jadhav, S. K.**

[1]Research Scholar, Surguja University, Ambikapur
[2]Department of Biotechnology, Pt. Ravishankar Shukla University, Raipur, (C.G.)

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ABSTRACT

Fungi make up a significant proportion of the tiny particles floating in the air. They play an important role in biodeterioration and degradation, act as an allergy trigger, cause of disease in humans, animals and plants. Knowledge of fungal spores present in the air can be useful in identifying allergens and pathogens, fungi that can cause mycotoxin contamination and spoilage. Aero mycological survey was carried out in the vegetable market of Ambikapur city for a period of two years using gravity Petri plate method. A total of 59 species belonging to 32 genera were identified. The most common fungi identified were species of *Aspergillus, Cladosporium, Alternaria, Curvularia , Penicillium and Fusarium*. The composition and concentration of fungal spores considerably varied from season to season. Winter season recorded highest number of fungal colonies followed by rainy and summer season. Important mycotoxin producing fungi such as A. *Aspergillus flavus, A. ochraceus, Penicillium citrinum, P. expansum, Fusarium, Alternaria* were isolated from the vegetable market.

INTRODUCTION

Fungi are ubiquitous in nature and it has the ability to grow on all substances available in the environment. Vegetable markets are one of many such environments that produce airborne fungi where spoiled vegetables, dumped plant materials and debris contribute significantly to the growth and dispersal of various types of airborne fungi and its spores. According to Pitt and Hocking (1985) the activity of nearly all fungi is to carryout biodegradation and deterioration because of their requirements for prime sources of carbon, nitrogen and other nutrients. Therefore moisture, nutrient availability and temperature are few important factors that determine fungal growth and hence prevalence in the air. Fungal spores present in the air by their deposition and colonization on vegetables and other valuable food products can lead to spoilage and reduction in market value of these products. Human exposure to airborne mold may result in a variety of adverse health effects including allergic and irritant responses, respiratory problems and hypersensitivity reaction. Chandel (2002). The adverse effect of inhaled fungal propagules on the immune system have been well documented by various workers. Day (1986); Burge (1985, 1989); Lacey (1991). Fungal infections can also increase the chances of contamination by mycotoxins which can cause neurological disorders, liver cancers, lung cancers and other diseases (Kakde and Kakde 2012). Information about the diversity and abundance of airborne fungi are relevant for many areas concerning human life, food storage, biodeterioration, health and disease etc. Aerobiological studies enable us to ascertain the concentration of fungal spores in the air and such studies have been developed in different parts of the world. (Tiwari and Jadhav (2004); Jadhav and Kunjam (2009) Raipur; Kakde *et al.* (2001) Nagpur; Kawasaki *et al*. (2010) Jaipur; Manoharachary *et al. (*1998) Hyderabad; Satpute *et al.* (1983) Shilong; Panda *et al*. (2009) Orissa; Omana *et al.* (2002) Thiruvananthapuram; Suerdem and Yildirim (2009) in Turkey; Das and Bhattacharya (2008) in West Bengal; Fung *et al*. (2005) in China; Rao *et al.* (2009) in Karachi Pakistan. No such studies are reported from this part of Chhattisgarh and therefore the present study was undertaken to assess the quality of air in the vegetable market in relation to its mycoflora.

Corresponding author: Shanthamma, J.
Research Scholar, Surguja University, Ambikapur.

MATERIALS AND METHODS

The aero mycological survey was carried out in the outdoor environment of vegetable market (Gudri Bazar), Ambikapur from march 2011 to February 2013 and gravity Petri plate method was used for the sampling. Sterilized Petri plates of 90mm diameter containing Potato Dextrose Agar medium were exposed in the air about one meter above ground level for five minutes at fortnightly intervals. The exposed plates were brought to laboratory and incubated at 27±1C for 5 to 7 days. After the incubation period the colonies were counted, isolated, maintained on PDA slants for identification and further study. Pure cultures were identified based on the cultural characteristics, microscopy, and micrometry and with the help of available literatures, Barnett, (1969); Ellis (1949); Hunter

and Barnett (1987); Nagamani *et al*. (2005). For confirmed identification, cultures were sent to Indian Type Culture collection Centre, IARI, New Delhi. The percent contribution and percent frequency of each isolate was calculated according to Jadhav and Kunjam (2009).

RESULTS

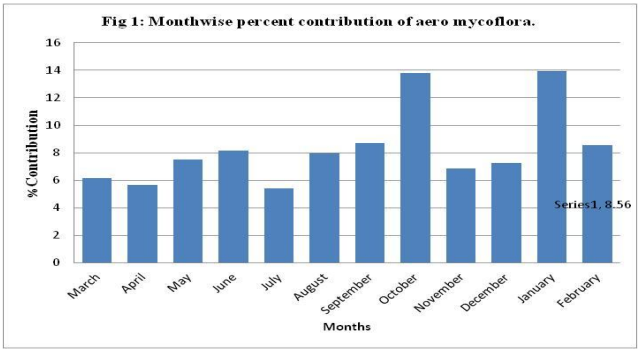
In the present study 59 species of culturable fungi belonging to 32 genera were identified from the air of vegetable market. A total of 144 samples were collected and 1762 colonies were isolated.

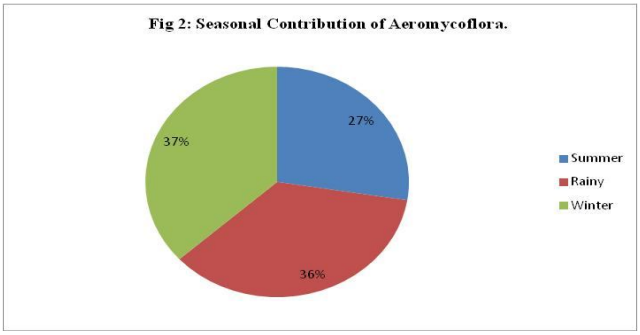
Aspergillus species were recorded abundantly and their percent contribution to the total airspora was 24.63% followed by species of *Cladosporium* (15.55%), *Alternaria* (13.6%), *Curvularia* (9.53 %), *Penicillium* (4.93 %) and *Fusarium* (2.83%). Among the least common fungi occurred was *Chaetomium, Neurospora, Gliocladium, Monodyctis*, and their percent contribution was (0.17 %). Among all the fungi isolated *Aspergillus niger* had the highest percent contribution (11.63) and is also the most frequent fungi having percent frequency of 70.83. *Gliocladium* was the least frequent fungi 0.69%. Species of *Aspergillus, Cladosporium, Alternaria, Penicillium* and *Fusarium* were recorded throughout the year.

Table 1. Percent contribution and percent frequency of aeromycoflora isolated from vegetable market, Ambikapur

S. No.	Name of Fungi	No. of Colonies	% contribution	% frequency (Observations- 144)
1	*Absidia spinosa*	7	0.39	4.86
2	*Cunninghamella elegans*	5	0.28	2.77
3	*Mucor variens*	8	0.45	5.55
4	*Rhizopus nigricans*	7	0.39	2.77
5	*Rhizopus stolonifer*	11	0.62	4.16
6	*Rhizopus nodosus*	5	0.28	3.47
7	*Chaetomium globosum*	3	0.17	1.38
8	*Chaetomium sp*	4	0.22	2.77
9	*Emericella nidulans*	18	1.02	4.86
10	*Alternaria alternata*	132	7.49	47.22
11	*Alternaria humicola*	59	3.34	19.44
12	*Alternaria solani*	17	0.96	4.86
13	*Alternaria sp.*	32	1.81	8.33
14	*Aspergillus candidus*	25	1.41	8.33
15	*Aspergillus flavus*	82	4.65	26.38
16	*Aspergillus fumigatus*	27	1.53	10.41
17	*Aspergillus niger*	205	11.63	70.83
18	*Aspergillus ochraceus*	29	1.64	11.80
19	*Aspergillus versicolour*	18	1.02	2.77
20	*Aspergillus parasiticus*	35	1.98	5.55
21	*Aspergillus sulfurius*	13	0.73	3.47
22	*Aureobasidium pullulans*	8	0.45	3.47
23	*Bipolaris sp.*	42	2.38	6.25
24	*Botrytis cineria*	32	1.81	4.16
25	*Cladosporium cladosporoides*	78	4.42	43.05
26	*Cladosporium herbarum*	66	3.74	31.25
27	*C. sphaerospermum*	43	2.44	22.22
28	*Cladosporium sp1*	39	2.21	7.63
29	*Cladosporium sp2*	48	2.72	5.55
30	*Candida albicans*	7	0.39	2.08
31	*Colletotrichum gleosporoides*	8	0.45	2.08
32	*Curvularia geniculata*	51	2.89	27.08
33	*Curvularia lunata*	82	4.65	44.44
34	*Curvularia sp.*	35	1.98	18.75
35	*Drechslera cyanodontis*	32	1.81	18.05
36	*Drechslera hawaiiensis*	7	0.39	2.08
37	*Epicoccum nigrum*	15	0.85	6.25
38	*Fusarium moniliformi*	11	0.62	4.86
39	*Fusarium oxysporum*	21	1.19	9.02
40	*Fusarium solani*	18	1.02	6.94
41	*Geotrichum sp.*	22	1.24	8.33
42	*Gliocladium sp.*	3	0.17	0.69
43	*Monilia sp.*	13	0.73	4.16
44	*Monodyctis fluctuata*	3	0.17	1.38
45	*Neurospora crassa*	3	0.17	1.38
46	*Nigrospora sphaerica*	9	0.51	3.47
47	*Penicillium citrinum*	42	2.38	15.97
48	*Penicillium chrysogenum*	18	1.02	8.33
49	*Penicillium expansum*	15	0.85	4.86
50	*Penicillium janthinellam*	12	0.68	2.77
51	*Pestalotiopsis glandicola*	32	1.81	13.88
52	*Pithomyces chartarum*	8	0.45	2.08
53	*Phoma putaminum*	9	0.51	2.77
54	*Stemphylium sp.*	7	0.39	2.77
55	*Trichoderma viride*	15	0.85	4.86
56	*Trichothecium roseum*	12	0.68	5.55
57	*Verticillium terrestrae*	13	0.73	3.47
58	Mycelia sterilia (white)	65	3.68	12.5
59	Mycelia sterilia (grey-black)	48	2.72	13.19
60	Unidentified sp.	35	1.98	10.41

Figure1indicates that the highest number of fungal spores was recorded in the month of January and it's percent contribution was 13.96 and minimum was observed in the month of July (5.39%). Maximum concentration of fungal colonies were observed during winter season (36.66%) followed by rainy season (35.8%) and summer season (27.52%) as shown in Figure 2.





DISCUSSION

These results are in accordance with the observations by Tiwari and Jadhav (2004), Jadhav and Kunjam (2009) in Raipur; Chauhan and Kulshrestha (2006) in Agra; Manoharachary *et al*. (1998) in Hyderabad; Kakde and Kakde (2012) in Nagpur. It is important to note that many of the fungal isolates such as *Aspergillus flavus, A. ochraceus, Penicillium citrinum, P. expansum, Fusarium, Alternaria* etc. can colonise vegetables and food products and produce mycotoxins including toxins that are carcinogenic like ochratoxins aflatoxins, and others. Ochratoxins A has been labelled as a carcinogen and a nephrotoxin and has been linked to tumors in the urinary tract, Mateo and Jimenez (2007); Bayman and Baker (2006). Many other fungi such as *Aspergillus fumigatus, A. niger, A. flavus, Alternaria, Cladosporium, Curvularia, Absidia, Aureobasidium pullulans* are capable of causing allergy and asthma, respiratory disorders in humans. Jain *et al*. (2002).

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