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PREVALENCE OF FUNGAL SPORES BELONGING TO DEUTEROMYCOTINA OVER GUAVA (*PSIDIUM GUAJAVA* LINN.) ORCHARD IN NASHIK, MAHARASHTRA, INDIA

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Abstract

The present aerobiological investigation was carried out at guava orchard in Nashik city, Maharashtra; by using volumetric Tilak Air Sampler for continuous two years *i.e.* from 1st January 2013 to 31st December 2014. Guava (*Psidium guajava* Linn.) is an important fruit crop of several tropical and sub-tropical countries. Nashik, besides the pioneer city in fruits, flowers & vegetables production, is one of the biggest guava growing pockets in the Maharashtra State. The permanent slides of spore catches were prepared; the prepared slides were scanned microscopically for identification and detailed observations of airborne bio particles. In the present aerobiological investigation, total 72 aerobiological components were trapped and recorded; these include 66 fungal spore types and 6 belonging to other bioparticles category; which consist hyphal fragments, pollen grains, algal filaments, epidermal hairs, insect parts and unidentified bioparticles. The spore group Deuteromycotina was found to be dominant and contributed maximum as 35 fungal spores, followed by Ascomycotina with 20 spore types, Phycomycotina with 7 spore types and Basidiomycotina with 4 spore types.

Key words : Deuteromycotina, guava, Nashik.

Introduction

Aerobiology is the study of dispersion of air borne microorganisms, pollens, seeds, especially fungal spores which can create the infections in plants and human beings or in another words aerobiology means study of airborne bio-particles (Sing and Mathur, 2012). Aerobiology is the study of airborne bioparticles present, in the atmosphere. Airspora, *i.e.* microbial population of the atmosphere which is composed of fungal spores, algal filaments, pollen grains and insect scales etc. It is an interdisciplinary science wherein attention is given to the source of an organism or material, take off, dispersion, deposition and impact on plants, animals & human systems (Ahire, 1990). The airspora of a region is influenced by topography & meteorological parameters of the concerned area. Aerobiology is a scientific discipline that, deals with the transport of organisms and biologically significant materials through the atmosphere (Isard and Gage, 2000). The availability and concentration of airspora totally depends on weather conditions and climatic factors such as temperature, humidity, rainfall, wind velocity. The substrate availability is also important factor; the concentration of airspora may differ according to the availability of substrate (Helfman *et al*., 2012). The wind velocity and direction also had importance in dispersion of spores. Different types of spores can easily get dispersed in nearby areas by wind. The spores float on wind and easily travel over long distance. The dispersion of pollutants as well as aerobiological agents is studied in environmental science which becomes a new emerging interdisciplinary branch of science (Tilak *et al*., 1983; Subba Reddy and Janakibai, 1977). The study incorporates external ambient air quality which protects the atmospheric particles and its interaction with abiotic factors and meteorological parameters (Butlin, 1990). Guava is an important, irrigated horticultural crop of Nashik district and is rich source of vitamin C & mineral elements. This is hardy crop, can be cultivated successfully even in neglected soils and it is attacked by large no. of pathogens mainly fungi (Gupta *et al*., 2010).

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Materials and Methods

Sampling site

Aerobiological investigations were carried out continuously for two years *i.e.* from 01.01.2013 to 31.12.2014; for the first time at Nashik (Maharashtra), India. The sampler was located in Gauva orchard in Kakad farm near Gangapur region, Nashik. Orchard selected for aerobiological study is situated in the Gangapur region 10 km away from Nashik city.

The apparatus and its working

The volumetric Tilak air sampler (Tilak and Kulkarni, 1970) was used for the aerobiological studies. It consist cubical tin box, runs on electric power supply and it will provide continuous sampling of air for 8 days. Air will be sucked in (5 liters/minute) and impinges on the transparent cellotape of the rotating drum coated with thin layer of petroleum jelly; thus the bioparticles from the air will be entrapped. The exposed cellotape was changed every 8 days and cut into 16 equal parts; each representing 12 hours trace area, of a day & night accordingly. The pieces of cellotape were mounted on microscopic slides using glycerine jelly as a mount.

Scanning : The scanning of collected sample was done regularly for the two year period. Total 9600 sq. micron of the area was obtained during daily scan by using 10x and 45x eye piece of the compound microscope as well as research binocular microscope. Scanning of prepared glass slides was done regularly & identification of bioparticles was based on microscopic diagnostic features, reference slides & available literature. Observations and collected data of pathogenic fungal spores and other bioparticles was compiled and analyzed. During this period; consecutive meteorological parameters such as temperature, relative humidity and rainfall was monitored. The meteorological data was obtained from

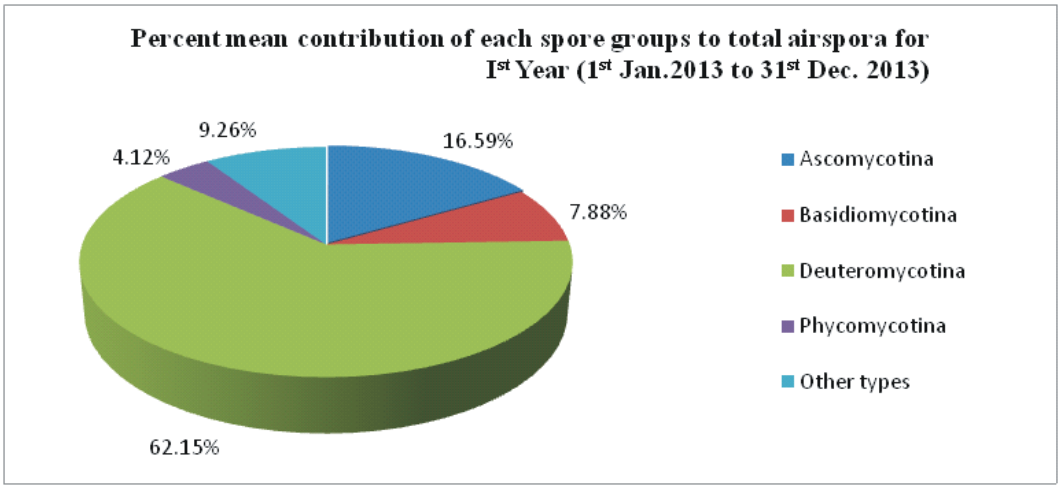

Fig. 1 (A) : Per cent mean contribution of each spore group to the total airspora for the period from 1st January 2013 to 31st December 2013.

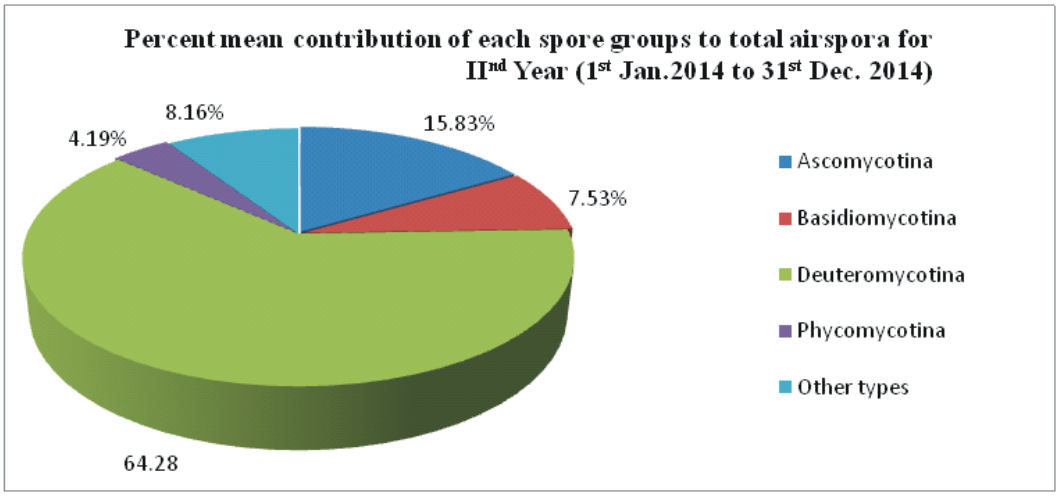

Fig. I (B) : Per cent mean contribution of each spore group to the total airspora for the period from 1st January 2014 to 31st December 2014.

Table 1 : Yearly average mean concentration and Percent mean concentration of spore types from 1st January 2013 to 31st December 2014 (for whole period of investigation).

S. no.	Deuteromycotina spore types	Concentration No. of spores per m^3		Percent mean contribution	
		01.01.2013 to 31.12.2013	01.01.2014 to 31.12.2014	01.01.2013 to 31.12.2013	01.01.2014 to 31.12.2014
1.	*Alternaria* Nees.	1711	1807	5.00	5.48
2.	*Aspergillus* Micheli ex Link.	281	301	0.82	0.96
3.	*Beltraniella* Subram.	22	27	0.07	0.08
4.	**No***Bispora* Corda.	210	204	0.61	0.65
5.	*Cercospora* Fr.	2001	1931	5.84	6.15
6.	*Cladosporium* Link.	2018	2058	5.89	5.98
7.	*Colletotrichum* Corda	2096	2103	6.12	6.72
8.	*Corynospora* Berk and Br.	971	713	2.83	2.11
9.	*Curvularia* Boed.	1399	1182	4.08	3.60
10.	*Dendrographium* Massee.	3	3	0.01	0.01
11.	*Diplodia* Fr.	351	374	1.02	1.20
12.	*Epicoccum* Link ex.Wallr.	184	196	0.54	0.56
13.	*Exosporium* Link.	312	345	0.91	1.10
14.	*Fusariella* Sacc.	3	3	0.01	0.01
15.	*Fusarium* Link.	1841	2003	5.37	5.82
16.	*Haplosporella* Speg.	165	175	0.48	0.56
17.	*Helminthosporium* Link. Ex Fr.	1142	1188	3.33	3.69
18.	*Heterosporium* Klotzsch.	63	70	0.18	0.22
19.	*Hirudinaria* Ces.	2	5	0.01	0.01
20.	*Memnoniella* Hohnel.	45	48	0.13	0.15
21.	*Nigrospora,* Zimm.	1982	1716	5.79	5.22
22.	*Oidium* Sacc.Link.	8	11	0.02	0.03
23.	*Penicilium* Link.	1648	1596	4.81	5.10
24.	*Periconia* Tode ex Schw.	304	332	0.89	1.06
25.	*Phoma* Desm.	110	117	0.32	0.37
26.	*Pithomyces* Berk and Br.	404	340	1.18	0.98
27.	*Pseudotorula* Subram.	900	940	2.63	3.00
28.	*Pyricularia* Sacc.	61	58	0.18	0.17
29.	*Spicaria* Auct.	32	34	0.09	0.11
30.	*Sporidesmium* De.not.	943	927	2.75	2.83
31.	*Stachybotrys* Corda	2	4	0.01	0.01
32.	*Stemphylium* Wallr.	19	25	0.05	0.08
33.	*Tetraploa* Berk and Br.	25	43	0.07	0.13
34.	*Torula* Pers. Link.	19	18	0.06	0.06
35.	*Trichoconis* Clem.	14	15	0.04	0.05

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Results and Discussion

The total concentration of 411115 spores/m^3 was recorded from 1st January 2013 to 31st December 2013 and 375368 spores/m^3 was recorded from 1st January 2014 to 31st December 2014. The class Deuteromycotina contributed maximum during the period of investigation than any other fungal spore group, it contributed total 35 fungal spore types to the total airspora. The class Deuteromyotina include spore types like *Alternaria*, *Aspergillus*, *Beltraniella*, *Bispora*, *Cercospora, Cladosporium, Colletotrichum*, *Corynospora*, *Curvularia, Dendrographium, Diplodia, Epicoccum, Exosporium, Fusariella, Fusarium, Haplosporella, Helminthosporium, Heterosporium, Hirudinaria,*

Table 2 : Per cent mean and average per cent mean concentration of spore groups for the whole period of investigation.

S. no.	Spore group	Percent mean contribution	
		01.01.2013 to 31.12.2013	01.01.2014 to 31.12.2014
1.	Deuteromycotina	62.15%	64.28%
2.	Ascomycotina	16.59%	15.83%
3.	Basidiomycotina	7.88%	7.53%
4.	Phycomycotina	4.12%	4.19%
5.	Other types	9.26%	8.16%
6.	Total airspora	100.00	100.000

Memnoniella, Nigrospora, Oidium, Penicillium, Periconia, Phoma, Pithomyces, Pseudotorula, Pyricularia, Spicaria, Sporidesmium, Stachybotrys, Stemphylium, Tetraploa, Torula and *Trichoconis.*

The percent mean contribution of Deuteromycotina spores was 62.15% in 2013 and 64.28% in 2014 to the total airspora. The average percentage contribution of Deuteromycotina was 62.15% in 2013 and 63.03% in 2014. Among the Deuteromycotina group; *Colletotrichum* spores contributed highest number with yearly concentration of 25146 spores/m^3 (6.12%) and 25230 spores/m^3 (6.72%) in the year 2013 and 2014, respectively. The fungal spores such as *Alternaria, Aspergillus, Cladosporium, Curvularia, Helminthosporium, Nigrosora*, *Cercospora Colletotrichum, Fusarium,* Smut spores etc. were collected significantly from the guava orchard; with their high concentration during the months of June to August (2013 and 2014), when the recorded rainfall was 116.4 mm & 84.8 mm, humidity 82.30% and 79.48% with minimum temperature recorded as 26.78^{0}C and 30^{0}C for 2013 and 2014, respectively.

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