J. Mycopathol. Res. ***52(1)*** *: 149-151, 2014;* (ISSN 0971-3719)

Airborne fungal diversity over home garden in Manipur valley

***A. PREMILA AND N. IRABANTA SINGH**
**Department of Botany, Standard College, Imphal 795001, Manipur*
Department of Life Sciences, Manipur University, Imphal 795003, Manipur

Received : 02.09.2013 RMs Accepted : 28.01.2014 Published : 28.04.2014

Monitoring of fungal airspora over a home garden was conducted for two years (January, 2009 to December, 2010) using Tilak rotorod air sampler. Altogether 24,05,395 spores/m^3 of air were trapped and assigned to 29 fungal types. Throughout the investigation period, various allergenic and phytopathogenic fungal spores were present in the air over home garden but in different concentrations. Aspergilli-Penicilli contributed highest with 19.67%. Other dominant fungal types were *Cladosporium, Albugo, Fusarium, Curvularia, Chaetomium, Alternaria,* etc. Different crops growing in the home garden served as the main source of the airspora. Seasonal variations were positively correlated with weather conditions. The average monthly contributions varied quantitatively in both the years.

Key words: Airspora, home garden, meteorological parameters, seasonal variation

INTRODUCTION

It is a well known fact that many of the fungal spores cause diseases of plants and animals. But their concentration varies with meteorological parameters, source, altitude, etc. (Agarwal and Shivpuri, 1969). Home garden is an inevitable component in the rural areas of Manipur, one of the seven sister states of northeast India. Every household in Manipur valley maintain home gardens for their day to day consumption. Home gardens never remain empty. Instead, they are always covered by seasonal crops, trees, etc. Seasonal crops include vegetables, pulses, spices, oil yielding crops, medicinal plants, etc. In Manipur, a lot of work on aerobiology has been carried out by Singh and his co-workers (Singh and Singh, 1994; Singh, 2006) but no information is available about the aeromycoflora of home gardens. Thus, the present investigation has been undertaken to assess the qualitative and quantitative concentration of airborne fungal spores over the home gardens of Manipur valley and their correlation with meteorological parameters.

MATERIALS AND METHODS

Monitoring of fungal airspora was done for two years (from January, 2009 to December, 2010). Air sampling was done using Tilak rotorod air sampler over a home garden located in Imphal West District, Manipur. Transparent cellotape was applied to the rods of the sampler, trimmed back to the width of the rods and coated with vaseline. The sampler was operated thrice a month by keeping at a height of 1 metre above ground level. Slides were prepared using glycerine jelly mountant and scanned regularly. Fungal spores were identified with the help of published literatures (Ellis, 1971; Barnett and Hunter, 1972) and by comparing with reference slides. The spore count was multiplied by the conversion factor, 5. During the investigation period, meteorological parameters were obtained from ICAR Research Centre, Imphal.

RESULTS AND DISCUSSION

All the catches were categorized into two groups – fungal spores and other types. Other types con-

Table 1 : Fungal airspora (average of total population) and their contribution (%) to different spore types over home garden in Manipur.

Spore types	Total number of spores / m^3 of air and percentage contribution					
	2009		2010		Total of 2009 & 2010	
	No.	%	No.	%	No.	%
MASTIGOMYCOTINA						
Albugo	150385	6.25	178340	7.41	328725	13.66
ZYGOMYCOTINA						
Round spores (*Rhizopus–Mucor* type)	16245	0.68	16680	0.69	32925	1.37
ASCOMYCOTINA						
Chaetomium	34530	1.44	38720	1.61	73250	3.05
Fusiform ascospores	1120	0.05	2305	0.10	3425	0.15
	35650	1.49	41025	1.71	76675	3.20
BASIDIOMYCOTINA						
Basidiospores	905	0.04	1310	0.05	2215	0.09
DEUTEROMYCOTINA						
Alternaria	65480	2.72	66575	2.77	132055	5.49
Aspergilli – Penicilli	199685	8.30	273455	11.37	473140	19.67
Beltrania	40	0.0016	90	0.003	130	0.0046
Bispora	65	0.002	65	0.002	130	0.004
Cercospora	2870	0.12	1970	0.08	4840	0.20
Cladosporium	261805	10.88	207150	8.61	468955	19.49
Colletotrichum	1050	0.04	1330	0.06	2380	0.10
Corynespora	180	0.007	160	0.006	340	0.013
Curvularia	69250	2.88	88660	3.69	157910	6.57
Diplodia	110	0.0045	135	0.0056	245	0.0101
Drechslera	885	0.04	1025	0.04	1910	0.08
Epicoccum	125	0.005	75	0.003	200	0.008
Fusarium	113955	4.74	108070	4.49	222025	9.23
Memnoniella	160	0.006	160	0.006	320	0.012
Nigrospora	5190	0.22	6015	0.25	11205	0.47
Periconia	300	0.012	150	0.006	450	0.018
Pestalotiopsis	55730	2.31	52835	2.20	108565	4.51
Pithomyces	40	0.0016	75	0.0031	115	0.0047
Sclerotium	12585	0.52	13565	0.56	26150	1.08
Spegazzinia	60	0.0025	60	0.0025	120	0.005
Tetraploa	215	0.008	110	0.004	325	0.012
Torula	670	0.03	410	0.02	1080	0.05
Trichoconis	130	0.005	135	0.006	265	0.011
Trichothecium	45	0.0019	35	0.0015	80	0.0034
	790625	32.8571	822310	34.1887	1612935	67.0458
OTHER TYPES						
Hyphal fragments	73950	3.07	72100	3.00	146050	6.07
Others*	89165	3.71	116705	4.85	205870	8.56
	163115	6.78	188805	7.85	351920	14.63
GRAND TOTAL	1156925	48.0971	1248470	51.8987	2405395	100

* excluding hyphal fragments

sist of pollen grains, insect scales, mycelial fragments, unidentified types etc. The fungal spores were assigned to 29 fungal types. Fungal spores contributed 85.37% and other types contributed 14.63% of the total airspora. The fungal types detected from the present investigation were classified into five sub-divisions as per Ainsworth's (1966) classification (Table 1). Out of the 29 fungal types identified, 24 fungal types belonged to Deuteromycotina, 2 to Ascomycotina and 1 each to Mastigomycotina, Zygomycotina and Basidiomycotina. The percentage contribution of individual spores to the total number of spores for two years in descending order were Aspergilli – Penicilli (19.67%), *Cladosporium* (19.49%), *Albugo* (13.66%), *Fusarium* (9.23%), *Curvularia* (6.57%), hyphal fragments (6.07%), *Alternaria* (5.49%), *Pestalotiopsis* (4.51%), *Chaetomium* (3.05%), round spores (Rhizopus-Mucor type) (4.37%) etc. The present finding was in agreement with previous reports (Sen and Asan, 2001; Stepalska and Wolek, 2005).

The concentration of spores in different months was shown in fig. 1. The highest concentration of spores was recorded in August contributing 8.9%

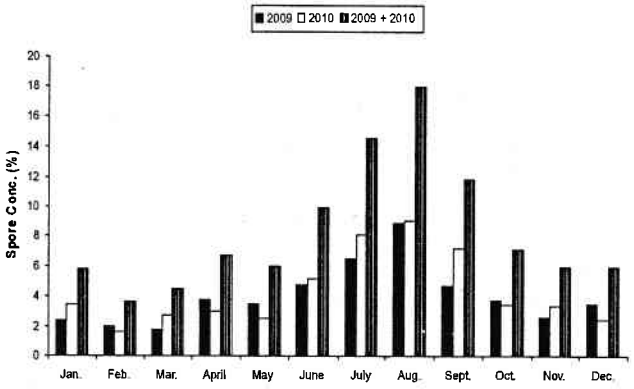

Fig. 1 : Monthly variations of total fungal airspora over home garden for 2009, 2010 and sum of 2009 and 2010

in 2009 and 9.03% in 2010. The coincidence of highest concentration of spores in August in both the years might be due to the presence of favourable weather conditions of high relative humidity (>85%), moderate temperature (29ºC) and average rainfall of about 6 – 7 mm with intermittent distribution of rain in the month. Similar view was opined by other workers (Lacey, 1981; Reddy, 1979; Mitakakis *et al.* 2001; Stepalska and Wolek, 2005 etc.)

Yearly analysis of data revealed more number of fungal spores during 2010 (12,48,470 spores/m^3 of air) than during 2009 (11,56,925 spores/m^3 of air). Even though there was a little higher in relative humidity (4.7%) and a slight difference in rainfall (1.5 mm), nearly 9.1 x 10^5 spores/m^3 of air was observed higher in 2010 than 2009. This might be due to the availability of substrates in addition to meteorological factors. Various workers reported similar results (Sen and Asan, 2001; Hameed, 2005). Lacey (1981) reported that grasslands and agricultural crops are the major sources of fungal spores which are liberated in the air by human activity specially during harvesting. The existence of airborne fungal biopollutants qualitatively and quantitatively as well as fluctuations in their occurrence are influenced by substrates specially different crops and weeds growing in the home garden, uprooted piled up unwanted weeds etc. in addition to the meteorological factors and disturbance of the substrates by the home gardeners.

ACKNOWLEDGEMENTS

The first author is grateful to the Principal, Standard College, Imphal for laboratory facilities and to Meteorological Section, ICAR Research Complex, Imphal for meteorological data.

REFERENCES

Agarwal, M.K. and Shivpuri, D.N. 1969. Studies on the allergenic fungal spores of Delhi, India, metropolitan area – Botanical aspects (aeromycology). *J. Allergy* **44** : 193 – 203.

Barnett, H.L. and Hunter, B.B. 1972. *Illustrated genera of Imperfect fungi.* 3rd Edn. Burgass, Publishing Co., USA, pp 241.

Ellis, M.B. 1971. *Dematiaceous Hyphomycetes.* C.M.I., England, pp 608.

Hameed, A.A.A. 2005. Vegetation : A source of air fungal biocontaminant. *Aerobiologia* **21** : 53 – 61.

Lacey, J. 1981. The aerobiology of conidial fungi. In. G.T. Cole and B. Kendrick (eds), *Biology of Conidial Fungi.* Vol 1. Academic Press. NY, pp. 373 – 416.

Mitakakis, T.Z., Clift, A. and McGee, P.A. 2001. The effect of local cropping activities and weather on the airborne concentration of allergenic *Alternaria* spores in rural Australia. *Grana* **40** : 230 – 239.

Reddy, C.S. 1979. A comparative survey of atmospheric pollen and fungus spores at two places twenty miles apart. *Acta Allergol.,* **25** : 189 – 215.

Sen, B. and Asan, A. 2001. Airborne fungi in vegetable growing areas of Edirne, Turkey. *Aerobiologia* **17** : 69 – 75.

Singh, N.I. and Singh, Ksh. R. 1994. Aerobiology and diseases of vegetables. *Front. Bot.* Sp. Vol. : 65 – 79.

Singh, N.I. 2006. Aerobiology, epidemiology and forecasting of fungal diseases found in certain crops of North Eastern India. *Ind. J. Aerobiol.* **19** : 12 – 18.

Stepalska, D. and Wolek, J. 2005. Variation in fungal spore concentration of selected taxa associated to weather conditions in Cracow, Poland, in 1997. *Aerobiologia* **21** : 43 – 52.