International Research Journal of Natural and Applied Sciences

ISSN: (2349-4077)

Impact Factor 5.46 Volume 6, Issue 6, June 2019

Website- www.aarf.asia, **Email** : editor@aarf.asia , editoraarf@gmail.com

ATMOSPHERIC CONCENTRATION OF AIRBORNE POLLEN GRAINS AT KAMPTEE DIST-NAGPUR

Jayshree Thaware

Department of Botany, S.K. Porwal College of Arts and Science and Commerce, Kamptee (MS)

e-mail- jsthaware@gmail.com

ABSTRACT

Aero Palynological survey, study of Atmospheric concentration of airborne pollen grains was carried out by Volumetric Tilak Air Sampler for one year from January 2017 to December 2017 at Porwal College, Kamptee. Kamptee is a satellite town of Nagpur situated 18 kilometer north to the Nagpur city in central India. Altogether 72 air borne bio-components were trapped. Out of 72 bio-components 51 were pollen morphotypes. Out of 51 pollen morphotypes 27 belonged to herb pollen grains, 11 shrubs and 13 belonged to tree pollen grains. *Parthenium* species pollens formed the major airborne component of airborne pollen spectrum followed by *Ricinus* spp. , *Amaranthus* spp., *Chenopodium* spp., grass pollen grains, *Bouganvellia* species etc.. Seasonal variation in the concentration of pollens had been studied and correlated with meteorological parameters. Monthly pollen catch and Meteorological data when subjected to statistical analysis it showed positive correlation.

Keywords: Pollen grains, seasonal variations, meteorological parameters, *Parthenium* pollen grain.

INTRODUCTION

An outdoor air is a full of micropropagules. The spores and pollen release from their source and become suspended in air. Pollen is appropriately referred by some as 'Golden dust' extremely valuable on account of their tremendous applications in science, industries and public health [1]. No other plant part even though extremely tiny in size is packed with so much information and power [2].In human beings, airborne pollen grains are one of the most important causative agents concerned with inhalant allergy. Information on airborne pollen types and their concentration in the atmosphere is a paramount importance to medical practitioner and allergy patients for establishing a chronological relationship between the concentration of airborne pollen, hay fever and asthma symptoms [3]. Composition of airborne pollen depends upon the type of vegetation. In view of that aero Palynological survey were carried out in various parts of India by various workers but a very less work is recorded in the central India. Due to various biotic and abiotic factors particularly climatic variations airborne pollen spectrum of a place keeps on continuously changing. A positive correlation of pollen concentration and surrounding vegetation density has been described indicating that changes in the floral composition of a given area have a direct influence on its airborne Pollen spectrum.

This paper presents a comprehensive account of aerobiological Survey conducted at Seth Kesarimal Porwal College premises during January 2017 to December 2017 at Kamptee. For Air sampling Volumetric Tilak air sampler [4] was kept at a constant height of 15 feet above the ground level on building of S. K. Porwal College for 1 year i.e. from January 2017 to December 2017. Tilak air sampler is an electrically operated machine which runs on electric power supply of (AC 230 V) & provides a continuous air sampling data for eight days. Sampler was kept with its orifice at constant height of 15 feet above the ground. The air was sampled at the rate of 5 liters per minute & the transparent cellophane tape was fixed on the drum, coated uniformly with white petroleum jelly as adhesive. This cellophane brought to the laboratory, slides were made and scanned.

Scanning

Loaded tape on each slide was divided into six equal divisions by marking it over cover slip with a pointed ball pen. Each division represents two hours air sampling. Scanning of slides was carried out under the binocular research microscope using 10X and 45 X magnification, as per the procedure [4]. The identification of bio-components like Pollen grains and fungal spore type was made on the basis of size, shape, pore and colpi number and position and septation using standard keys and available authentic literature. The prepared aerobiological slides where thoroughly scanned in order to ensure counting of pollen grains.

The Pollens per cubic meter were calculated by the following formula,

Pollens/m^3 = No. of same type of spore X 14

(14 is the conversion factor for Tilak Air Sampler)

Figure 1: Volumetric Tilak Air Sampler

The identification of pollen grains was done with the help of reference slides and published literature [1], [5]-[8]. The co-relation between daily pollen counts and meteorological parameters were calculated. Altogether 51 airborne Pollen types were trapped, among them 27 belonged to herb Pollen types, 11 from shrubs and 13 from tree pollen grains. The highest Pollen count 2368 pollens/m^3 of air was recorded in the month of November 2017 when there was 22.9^{0}C average temperature was recorded, 57.70% average Relative Humidity,8.8 mm rainfall and 4.50 Km/ hour wind velocity recorded. Lowest count of pollen grains was 103 pollens /m^3 found in July when there was a record of average mean temperature 31.2^{0}C, 74.25% average means Relative Humidity, 331 mm rainfall and 5.10Km/hr average wind velocity.(Table1; figure2)

Slight rise in temperature, low rainfall, low or medium relative humidity and wind velocity during the months from November to March were prevailing and have favoured for the Liberation of pollen grains. In rainy season, washing off effects resulted in reducing the concentration of pollen grains. Another reason for reducing concentration of pollen morphotypes catches were due to the prevalence of maximum percent of relative humidity, pollen grains might have absorbed moisture from atmosphere and got imbibed with the result that they lost buoyancy and settle down rapidly. Similar observations were also reported by earlier workers [9]-[23].

During the period of present investigation 51 morphotypes were recorded. From among them total pollen grains of *Parthenium* species 840 pollens/m^3 of air the major component with 8.698% contribution of the airborne pollen spectrum. Next dominant type were the *Ricinus* species (546 Pg/m^3 of air), *Amaranthus* species (518 pg/m^3 of air), *Eucalyptus* spp. (476 pg/m^3) *Chinopodium* spp. (420 pg/m^3), grass pollens (406 pg/m^3), *Bougainvillea* spp. ,*Cassia* spp., *Terminalia* spp. etc The lowest airborne pollen catches were of *Melia* spp. *Withania* spp. with 0.289% contribution and lowest by *Indigofera* spp. with 0.186% contribution of total pollen catches during the study period.

Incidence of pollen morphotypes in the atmosphere was throughout the investigation. Never the less quantitatively maximum number of pollen morphotypes were observed in the month of January, July, November, December-2017 with 10 pollen types.

Correlation of airborne Pollen with meteorological parameters Meteorological conditions play important role in influencing the concentration of pollen grains in the atmosphere. Daily variation in the concentration of pollen grains showed a significant mean percent of Relative Humidity (Table 1).

High Relative Humidity and rainfall coincides with the low pollen counts during July and August 2017. However, during August comparatively higher rainfall and Relative Humidity was recorded which may be responsible to reduce the Pollen catch.

Spearman's rank correlation analysis was done between Meteorological Factors (Average Temperature,

Relative Humidity and Total Rainfall) and Average pollen catch/m3/min of every month of sampled year. The results were highly significant. It was seen that Average Temperature above 30^{0}C, Relative Humidity at 65%, and Total Rainfall above 115mm and below 85 mm impacted significantly on pollen diversity and count.

Table 1: Total pollen grain concentration/m3 of air and meteorological data for the period of January 2017 to December2017.

Sr. No.	Month	Total pollen conc./m^{3}of air	Average R.H. in % at 8.30 am.	Average Rainfall in mm	Average Temp. in ^{o}C	Average Wind velocity in Km/hr.
1	January	883	46.15	Nil	21.9	4.50
2	February	1036	41.90	Nil	25.3	5.77
3	March	852	42	14.2	38.2	5.24
4	April	282	33.40	Nil	41.5	3.67
5	May	163	52.60	9.7	42.3	4.90

6	June	367	67.25	135.1	37.6	6.89
7	July	103	74.25	331	31.2	5.10
8	August	180	81.75	305	29.7	4.24
9	September	205	78.90	233	32.1	3.80
10	October	1332	60.85	Nil	33.5	4.67
11	November	2368	57.70	8..8	22.9	4.50
12	December	1886	52.70	Nil	24.3	4.70
		9657 pollen catch /m^3 in one year				

Figure 2: Graph of total pollen concentration/m^3per month.

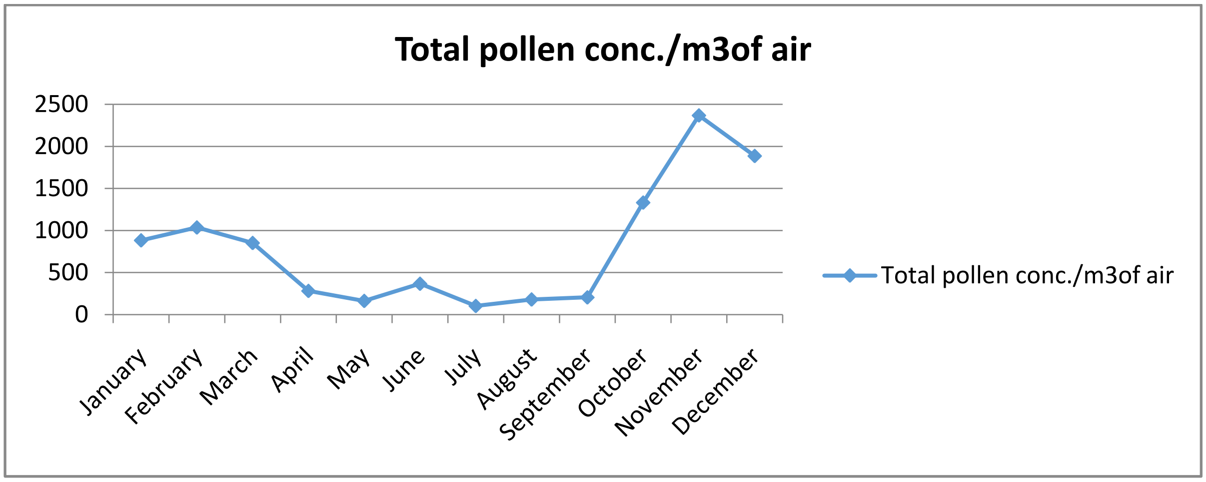

Table 2: Total pollen concentration and percentage contribution of airborne components during January 2017 to December 2017.

Sr.No.	Name of the pollen grains	Total pollen grain concentration/m^3	Percentage contribution	Type of pollen
1	*Adathoda* spp.	420	4.349	Herb
2	*Acacia* spp.	154	1.594	Shrub
3	*Amaranthus* spp.	518	5.363	Herb
4	*Argemone* spp.	182	1.884	Herb
5	*Azadiracta* spp.	210	2.174	Tree
6	*Achyranthus* spp.	168	1.739	Herb
7	*Acalypha* spp.	84	0.869	Herb
8	*Alnus* spp.	98	1.014	Herb
9	*Annona* spp.	112	1.159	Tree
10	Apocynaceae pollen	98	1.014	Herb
11	Asteraceae pollens	168	1.739	Shrub
12	*Bougainvillea* spp.	350	3.624	Shrub
13	*Carica* spp.	56	0.579	Shrub
14	*Hibiscus* spp.	105	1.087	Tree
15	*Caesalpinia* spp.	40	0.414	Tree
16	*Callistemon* spp.	154	1.594	Tree
17	*Cassia* spp.	280	2.899	Herb
18	*Catharanthus* spp.	120	1.242	Herb
19	*Cyperus* spp.	168	1.739	Herb
20	*Chenopodium* spp.	420	4.349	Herb
21	*Cleome* spp.	126	1.304	Herb
22	*Capparis* spp.	182	1.884	Herb
23	*Cannabis* spp.	238	2.464	Herb
24	*Capsicum* spp.	42	0.434	Herb
25	*Corchorus* spp.	20	0.207	Herb
26	*Croton* spp.	70	0.724	Herb
27	*Celosia* spp.	72	0.745	Herb
28	*Delonix* spp.	98	1.014	Tree
29	*Datura* spp.	368	3.810	Shrub

30	*Eucalyptus* spp.	476	4.929	Tree
31	Grass pollens	406	4.204	Herb
32	*Indigofera* spp.	18	0.186	Tree
33	*Impatiens* spp.	32	0.331	Tree
34	*Ipomoea* spp.	144	1.491	Shrub
35	*Lantana* spp.	266	2.754	Herb
36	Malvaceae members	182	1.884	Herbs
37	*Moringa* spp.	63	0.652	Tree
38	*Morus* spp.	71	0.735	Tree
39	*Melia* spp.	28	0.289	Tree
40	*Mangifera* spp.	138	1.429	Tree
41	*Mimosa* spp.	184	1.905	Shrub
42	*Parthenium* spp.	840	8.698	Herb
43	*Nerium* spp.	88	0.911	Shrub
44	*Ocimum* spp.	86	0.890	Herb
45	*Ricinus* spp.	546	5.653	Shrub
46	*Tamarindus* spp.	242	2.505	Tree
47	*Typha* spp.	308	3.189	Herb
48	*Tephrosia* spp.	56	0.579	Herb
49	*Withania* spp.	28	0.289	Herb
50	*Xanthium* spp.	196	2.029	Herb
51	*Ziziphus* spp.	138	1.429	Shrub
	Total pollen catch during study period	**9657 pollens/m^{3}of air**		

CONCLUSION

It is evident from the above discussion that there may be significant annual variation in the monthly pollen counts. This variation seems to be related with prevailing meteorological conditions which in turn affects flowering period and anthesis. To update the pollen calendar of a locality aeropalynological survey should be continued as a continuous process.

The present investigation will provide useful Aero Palynological information to clinicians for the diagnosis and treatment of allergic disorders.

ACKNOWLEDGEMENT

Author is thankful to University Grants Commission, New Delhi for providing financial support in the form of Major Research Project. Author is also thankful to Authorities and Staff of Seth Kesarimal Porwal College for their support.

REFERENCES

[1] Agashe, S.N., *Palynology and its Applications*. Oxford IBH publishing Co. Pvt. Ltd., New Delhi pp. v-vii. 2006.

[2] Rangari, J.G. “Palynological Studies in Plants with Anticancer Activities” Ph.D. Thesis, RTMNU, Nagpur (MS) India Dec.2008.

[3] Jayshree Thaware and A. A. Saoji . “Pollen Storage studies in Brassica Juncea L. Czern and Coss.” *International Journal of Researches in biosciences, Agriculture and Technology* Vol. (V), Special issue (2): pp. 990-995.2017.

[4] Tilak, S.T. and Kulkarni “ A new air sampler”. *Experimentia*. 20:443-444. 1970.

[5] Erdtman, G. *Pollen morphology and plant taxonomy* 533 pp. Hafner publishing company, New York and London.1952.

[6] Nair, P.K.K., Joshi ,A.P. and Gangal ,S.V. “Airborne pollen, spores and other plant materials of India -A survey” pp.224. CSIR Centre for Bio-Chem and NBRI, Lucknow .1986.

[7] Tilak, S.T. *Airborne Pollen and fungal spores* Vaijayanti Prakashan pp. 312.1989.

[8] Bhattacharya, K., Majumdar, M. R., Bhattacharya, S. G. *A textbook of Palynology*. New Central Book Agency, (P), Ltd., Kolkata. 2006.

[9] Vishwe, D.B. “Studies of airspora at Aurangabad.” Ph.D. thesis, Marathwada University, Aurangabad.1979.

[10] Tripathi,D. and Oomachan,M. “ Census of atmospheric pollen at Bhopal.” *Proc. Nat. Conf. Env. Bio.* pp. 73- 79. 1981.

[11] Galán C, Alcázar-Teno P, Domínguez-Vilches E et al. Airborne pollen grain concentrations at two different heights. *Aerobiologia*. 11(2): 105-109. 1995. https://doi.org/10.1007/BF02738275

[12] Chakraborty P, Gupta-Bhattacharya S, Chowdhury I. Differences in concentrations of allergenic pollens and spores at different heights on an agricultural farm in west Bengal, India. *Ann Agric Environ Med.* 8(2): 123-130.2001.

[13] Mishra, R.P., Singh,B. and Oomachan,M. Airborne pollen flora of Jabalpur-The central India .*Aerobiologia*.18: 73 – 81.2002.

[14] Pande, S.K "Aerobiological study with special reference to Urban pollen grains of Banda District (UP)." Ph.D. thesis Bundelkhand University, Jhansi.2002.

[15] Kasprzyk I, Uruska A, Szczepanek K et al. Regional differentiation in the dynamics of the pollen seasons of Alnus, Corylus and Fraxinus in Poland (Preliminary results). *Aerobiologia*. 20: 141-151.2004. https://doi.org/10.1023/B:AERO.0000032951.25974.c9

[16] Sahaney, M. and Chaurasia,S. Survey of airborne pollen grains at Allahabad during 2002-2004. *Indian Journal of Aerobiology* 21(1):1-12. 2008.

[17] Alwadie H.M. Pollen Concentration in the Atmosphere of Abha City, Saudi Arabia and its Relationship with Meteorological Parameters. *J. Appl. Sci.* 8(5): 842-847. 2008. https://doi.org/10.3923/jas.2008.842.847

[18] Godbole, G. and Pande, B.N. Atmospheric concentration of airborne pollen grains at Aurangabad. *The Botanique*. 14 (1): 12-21.2010.

[19]Veriankaitė L, Šaulienė I, Bukantis A. Evaluation of meteorological parameters influence upon pollen spread in the atmosphere. *Journal of Environ Eng Landsc* 19(1): 5-11.2011. https://doi.org/10.3846/16486897.2011.557252.

[20] Puc M. Influence of meteorological parameters and air pollution on hourly fluctuation of birch (Betula L.) and ash (Fraxinus L.) airborne pollen. *Ann. Agric Environ. Med.* 19(4):660-665.2012.

[21] Ianovici N. Relation between Poaceae pollen concentrations and meteorological factors during 2000–2010 in Timisoara, Romania. *Acta Agrobotanica.* 68(4): 373-381.2015. https://doi.org/10.5586 /aa.2015.033

[22] Fang Y, Ma C, Bunting J et. al. Airborne pollen concentration in Nanjing, Eastern China, and its relationship with meteorological factors. *J. Geophys Res Atmos.* 10: 842-856.2018.https://doi.org/10.1029/2018JD029026

23] Katarzyna Dabrowska-Zapart,Tadeusz Niedzwiedz . Height and hourly variation in the concentration of airborne pollen grains and fungal spores in Sosnowiec(Poland). *Alergoprofile*. 16(1):21-33. 2020.

.