Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231-6345 (Online)
An Online International Journal Available at http://www.cibtech.org/jls.htm
2013 Vol. 3 (1) January-March, pp.214-219/Dimple Singh et al.
Research Article

DIURNAL PATTERN FOR HOLOPTELIA INTEGRIFOLIA POLLEN, AT JAIPUR

***Dimple Singh[1], W. Dubey[1] and U. V. Singh[2]**
[1]*Department of Botany, Mahatma Gandhi Institute of Applied Sciences, Jaipur, India*
[2]*Research Division, Asthma Bhawan, Jaipur, India*
**Author for Correspondence*

ABSTRACT
Aeroallergens play a major role in the pathogenesis of respiratory allergic diseases, particularly asthma and allergic rhinitis. Allergic diseases are becoming common in Jaipur.
A diurnal variation of the pollen count in air for the Holoptelia integrifolia was analysed and this gave a single intradiurnal pattern for the same in the city of Jaipur. By considering only the average diurnal pattern, we visualised the average behaviour of pollen release in the atmosphere.
The count was lowest between 4-6 am and increased from 6am onwards. It had the highest concentration between 2-4 pm and reduced then onwards.
Pollen concentration for Holoptelia integrifolia in day from 6am-8pm is double of the night i.e 8pm-6am.Our study gives data for the physician and the allergic patients to Holoptelia integrifolia to have instructions which may help them to avoid exposure to the open air at the peaks during the 24 hrs in the day.

Key Words: *Airborne Pollen, Aeropalynological, Holoptelea Integrifolia*

INTRODUCTION
Allergic diseases are increasing in prevalence throughout the world (Anthracopoulos *et al.,* 2001; Anonymous, 2000 and Chhabra *et al.,* 1998). Environmental pollens are important trigger factors inducing asthma, rhinitis and conjunctivitis (Singh *et al.,* 2004). Recently published (ISAAC) studies show quite high prevalence of allergic diseases in Jaipur area (Narayanappa *et al.,* 2012). The evidence suggests a causal relationship between exposure to pollens and exacerbation of asthma (D'Amato *et al.,* 1994 and Maunsell, 1971).Worsening of these diseases is usually observed during the pollination season of the plant species. Pollinating plant releases pollens in the environment and air disseminate it in neighbouring areas. Sometimes pollens are disseminated to distant areas with wind (Bicakci *et al.,* 2000 and Conner *et al.,* 1996). Identification of pollens in a particular place may prove useful in clinical advice to allergic patients. Patient suffering from pollen allergy of a particular plant can take preventive steps during that particular season. In the ISAAC study it was observed that prevalence of nose symptoms was second highest in the country.
In the case of taxa registered far from the sampling point, the movement of air masses determines the time of day that maximum concentrations are registered (Raynor *et al.,* 1971 and Rantio-Lehtimaki *et al.,* 1991 and Norris-Hill *et al.,* 1991) described a very special daily variation for grasses in London, England, given that they were scarcely represented in the sampling area, with their maximum pollen concentration appearing between 6 p.m. and 10 p.m.
An average diurnal pattern of pollen concentrations through the main pollen season has been proposed by some authors like (Galan *et al.,* 1988 and Recio *et al.,* 1996).
March has the maximum numbers of pollen taxas and the highest concentration of pollens of any taxa, belongs to Holoptelea integrifolia (Sahney *et al.,* 2008). Holoptelea integrifolia is highly allergic and thus requires an extensive study.
In this study, we analyzed the diurnal variation in pollen concentrations of the most abundant taxa during the month of March in the air of Jaipur.

MATERIALS AND METHODS

Pollen monitoring was performed from 1st March 2011 to 31st March 2011 using a Hirst-type volumetric sampler (Burkard–24hrs recording spore-trap), set at approximately 14 m above ground level on the roof of the Asthma Bhawan, Vidhyadhar Nagar and located in the North Western region of Jaipur.

The methodology has involved

Sampling Device for Collecting Pollen

Aerobiological sampling was carried out to monitor the qualitatively and quantitative prevalence of aeroallergens through Burkard 24hr. spore trap system, which is a type of suction sampler.

It consists of a horizontally free rotating chamber with a single opening that is oriented toward the wind by a wind vane. Above the opening a plate protects the entry from the rain, but also to obtain a regular air flow. Behind the opening a glass slide coated with adhesives is placed. The slide moves upward from the lowermost position and reaches the top most end in exactly a given time period of one day (24hrs). Below the chamber a centrifuge pump gently aspirates a standard volume of air (10litres/min.) through the opening of the chamber and impact onto the glass slide coated with the adhesives. The aerobiological material including pollen grains stick to the glass slide coated with the adhesives.

The pollen sampler was installed at roof top of Asthma Bhawan, at around 14 meter height from ground. 24hrs of pollen sample was collected from 12:00 noon to 12:00 noon.

Method of Collection

The spore trap system is loaded with a glass slide on which Mowiol (earlier known as Gelvatol) is coated. This slide is placed in the sampler and the trapping of the aerobiological material takes place from one end to other at a speed of around 2mm/hr, covering the whole slide in 24hr.

Analysis of Air Samples

Samples were analyzed by direct microscopy. Identification of airborne pollen was done by comparing them with the corresponding pollen in the reference collections. The taxonomic characters like number and distribution of apertures and various patterns of ornamentation of exine are the chief characters employed for the identification of atmospheric pollen, as confirmed from standard literature for pollen identification by Erdtman (1952) and Faegri and Iverson (1964).

Pollen Counting

The counting was performed on a daily basis using British Aerobiological Federation manual (Guide to trapping and counting). For the daily pollen count estimations, 12 longitudinal sweeps per microscope slide were made and the 2 hourly counts were obtained along the same sweeps with the aid of a small ruler impressed on acetate paper stuck to the reverse of the slide, following the method recommended by the British Aerobiology Federation. Mean daily and hourly pollen concentrations are expressed as grains per cubic metre of air.

Statistically Analysis

The observations of the study are statistically analysed to get the result using the SPSS software version 10.0.

RESULTS AND DISCUSSION

In the study period of 1 month i.e 1st March 2011 to 31st March 2011 a total of 4376 pollen grains/m^3 was contributed by 22 pollen grain types identified during the study period viz. by Acacia, Argemone, Asteraceae, Azadirachta, Albizzia, Brassica, Bauhinia, Bombax malabaricum, Balanites aegyptica, Cheno-Amaranthus, Callistemon, Eucalyptus, Holoptelea, Morous alba, Magnifera indica, Moringa, Nerium indicum, Parkisonia, Parthenium, Poeaceae, Prosopis and Ricinus communis.

Dominance of arboreal taxa in the pollen spectrum has also been reported by other researchers (Kapyla *et al.*, 1984; Kuoh *et al.*, 1999; Raynor *et al.*, 1971 and Norris-Hill *et al.*, 1991). Among arboreal taxa, pollen grains of *Holoptelea integrifolia* ranked first constituting 46.21% of the total catch.

The Pollen concentration of Holoptelia integrifolia for the month of march, in number per cubic meter of air in every 2hrs for the day is as shown in the Table 1. The values are the sum total of the number of

pollens in every 2hr for all the days of March. The two-hours values are regarded as mean values over two hours and consequently, we have chosen to draw them as histograms in the graphs shown.

Table 1: The graphical presentation of the pollen concentration from Table1 is shown in Figure 1.

Time	12:00	14:00	16:00	18:00	20:00	22:00	00:00	02:00	04:00	06:00	08:00	10:00
Pollen Conc.	167	158	124	95	70	108	147	83	58	110	162	280
Mean Count	6.95	6.86	7.29	5	4.66	9.88	9.8	6.38	4.46	7.33	9	10.76
Mean %	495	594	259	175	116	128	226	136	76	135	206	584

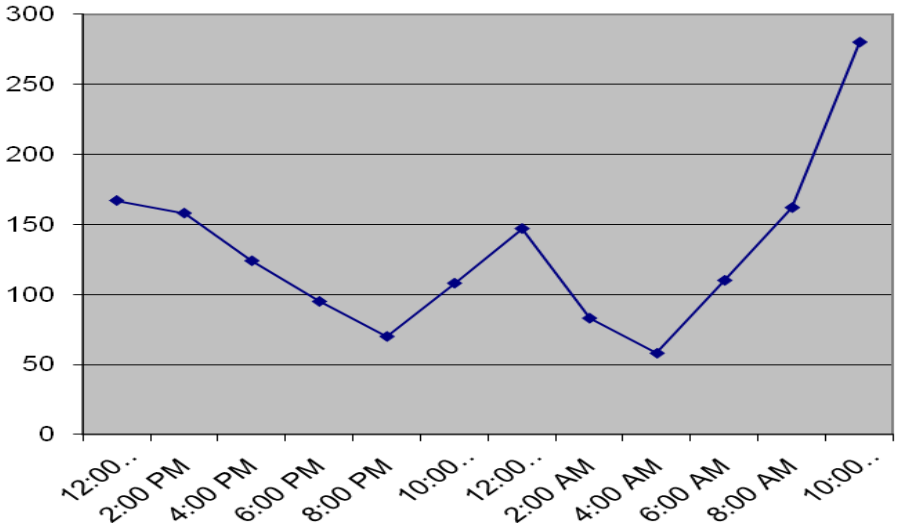

Figure 1: Pollen concentration in no. per c.u.m. of air

In this it makes a clear picture of a diurnal pattern which shows that between 8-10 am the highest pollen concentration is achieved and it decreases there after till 8 pm. At 8 pm the lowest value of 70 pollens per cu. m. of air is seen. Then again it increases till 12 am and decreases thereafter. This dips to a value of 58 pollens per cu. m. between 2- 4 am and starts increasing thereafter.

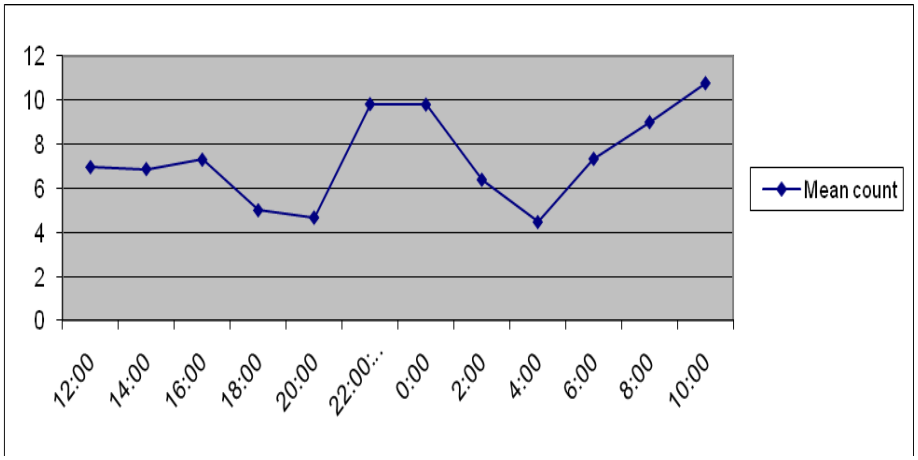

Figure 2

As per the values in Table:1 and the relative graphical presentation by Fig:2, it comes that the mean Pollen concentration for the total days of March shows that the maximum number is achieved in the 2hr slot between 10 am – 12 pm. It starts decreasing then onwards and till 8pm gets to lower number and then increases slightly till 12 am – 2 am and is lowest between 2-4 am.

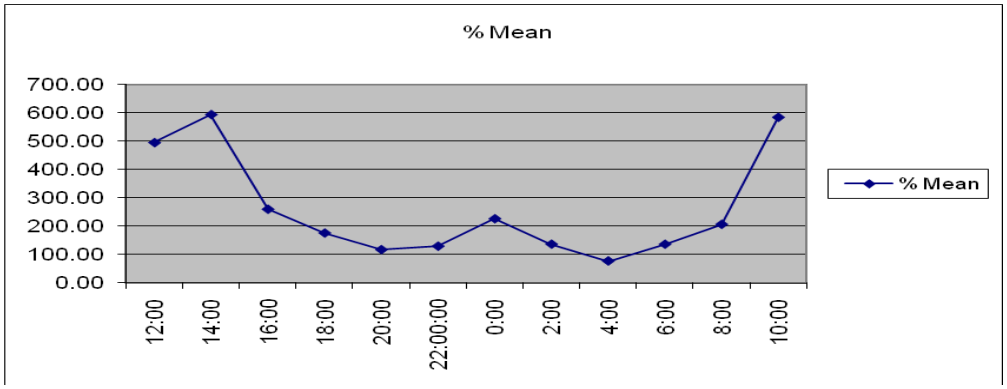

Figure 3

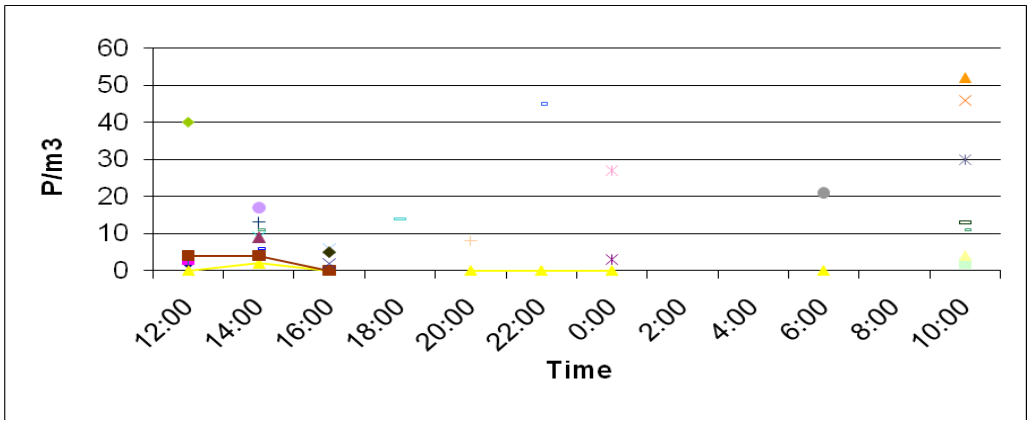

Figure 4

Distribution of Diurnal Maxima as per Fig:4 and there values show that the daily maxima is between 10 to 12 in noon and this has both maximum number of maximas as well as the highest maxima value i.e 52 pollens/ m^3 of air.

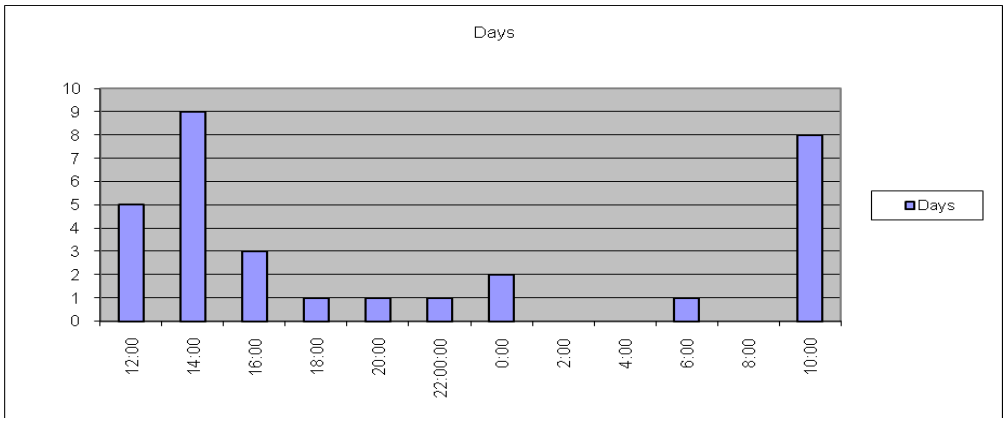

Figure 5

Distribution of the number of diurnal maxima according to the particular 2-hour periods as per Fig:5; Number of days included to the analysis. The maximum number of days having maxima is 9 days at 14hrs and then at 10hrs.

Kapyla (Kapyla *et al.,* 1984) has studied the effect of several meteorological variables on the diurnal variation of tree pollen concentration for a number of species. He selected some days during the peak periods and also found peaks during the night; on occasions when the relative humidity was not noticeably high but the night temperature was relatively high. As might be expected, increasing temperature and decreasing relative humidity were closely correlated with increasing pollen amounts. We also found this in our study and most of the days showed peak during the day and specifically between 10-12 hrs**.**

Spieksma (Spieksma *et al.,* 1983 and Spieksma *et al.,* 1986) in their studies got that the daily fluctuations were due to pollen production and release in combination with wind direction and precipitation. Norris-Hill (Norris-Hill *et al.,* 1991) also studied the effect of temperature and relative humidity on pollen incidence.

Study of the diurnal variation of birch pollen in Sweden, Berggren (Berggren *et al.,* 1995) has showed that the effect of rainfall on pollen counts is more complex than was previously thought. Most of the pollen counting sites in Sweden showed the same pattern of diurnal variations as described by other observers, i.e. lower concentrations during the early morning and a maximum in the middle of the day or early in the evening. We would also like to add to this as we observed the same phenomena for the *Holoptelea integrifolia* pollen in our study.

Conclusion

We got a single intradiurnal pattern for Holoptelia integrifolia pollen in the city of Jaipur. By considering only the average diurnal pattern, we are only visualising the average behaviour of pollen release in the atmosphere.

The count is lowest between 4-6 am and starts increasing from 6am onwards. It has the highest concentration between 2-4 pm and reduces then onwards.

Pollen concentration for Holoptelia integrifolia in day from 6am-8pm is double of the night i.e 8pm-6am.

This clearly indicates that the allergic patients to Holoptelia integrifolia should avoid walking and jogging especially in the morning after 6am.

Thus our study gives data for the physician and the allergic patients to Holoptelia integrifolia to have instructions which may help them to avoid exposure to the open air at the peaks during the 24 hrs in the day.

REFERENCES

Anthracopoulos M, Karatza A, Liolios E, Triga M, Triantou K and Priftis K (2001). Prevalence of asthma among schoolchildren in Patras, Greece: three surveys over 20 years. *Thorax* **56**(7) 569-571.

Anonymous (2000). All India Coordinated Project on Aeroallergens and Human Health Report. Ministry of Environment and forests, New Delhi.

Berggren B, Nilsson S and Boethius G (1995). Diurnal variation of airborne birch pollen in some sites in Sweden. *Grana* **31** 251-259.

Bicakci A and Akyalcin H (2000). Analysis of airborne pollen fall in Balikesir, Turkey, 1996-97. *Annals of Agricultural and Environmental Medicine* **7** 5-10.

Chhabra SK, Gupta CK, Chhabra P and Rajpal S (1998). Prevalence of bronchial asthma in schoolchildren in Delhi. *Journal of Asthma* **35**(3) 291-296.

Conner AJ and PJ Dale (1996). Reconsideration of pollen dispersal data from field trials of transgenic potatoes. *Theoretical and Applied Genetics* **92** 505-508.

D'Amato G, Gentili M, Russo M, Mistrello G, Saggese M, Liccardi G and Falagiani P (1994). Detection of Parietaria judaica airborne allergenic activity: comparison between immunochemical and morphological methods including clinical evaluation. *Clinical and Experimental Allergy* **24** 566-574.

Fomaciari M, Bricchi E, Greco F, Fascini D, Giannoni C, Fren-guelli G and Romano B (1992). Daily variations of Urticaceae pollen count and influence of meteoclimatic parameters in East Perugia during 1989. *Aerobiologia* **8** 407-413.

Galan C, Infante F, Ruiz de Clavijo E and Dominguez E (1989). Allergy to pollen grains from Amaranthaceae and Chenopodiaceae in Cordoba, Spain. *Annals of Allergy* **63** 435-238.

Gergen P and Turkeltaub P (1992). The association of individual allergen reactivity with respiratory disease in a national sample: data from the second National Health and Nutrition Examination Survey, 1976-80 (NHANES II). *Journal of Allergy and Clinical Immunology* **90** 579-588.

Gregory P, LeGatan C, Tormo R, Cuevas J, Infante R and Domfnguez E (1991). Theoretical daily variation patterns of airborne pollen in the South-West of Spain. *Grana* **30** 20.

D'Amato G,Cecchi L, Bonini C, Nunes I, Annesi-Maesano H, Behrendt G, Liccardi T, Popov P and Van Cauwenberge (2007). Allergenic pollen and pollen allergy in Europe. *Allergy* **62** 976-990.

Guvensen A and Ozturk M (2002). Airborne pollen calendar of Buca-Izmir, Turkey. *Aerobiologia* **18** 229-237.

Kapyla M (1981). Diurnal variation of non-arboreal pollen in the air in Finland. *Grana* **20** 55-59.

Kapyla M (1984). Diurnal variation of tree pollen in the air in Finland. *Grana* **23** 167-176.

Kuoh C, Liao G, Wu C and Wu C (1999). Airborne pollen concentration in Tainan, Taiwan, 1993-1995. *Taiwania* **44**(1) 22-30.

Lehrer S, Hughes J, Altman L, Bousquet J, Davies R, Gell L, Li J, Lopez M, Mailing H and Mathison D (1994). Prevalence of basidiomycete allergy in the USA and Europe and its relationship to allergic respiratory symptoms. *Allergy* **49** 460-465.

Mandal J, Chanda S, Gupta and Bhattacharya S (2006). Current status of airborne pollen grains in Kolkata with special reference to their allergenic significance. *Indian Journal Aerobiology* **19**(1) 19-30.

Maunsell K (1971). The impact of aerobiology on allergy. *Acta Allergologica* **26**(5) 329-350.

Mishra RP, Bhandari S and Oommachan M (1997). Atmospheric pollen calendar for Jabalpur, Madhya Pradesh. *Journal of the Indian Botanical Society* **76** 29-32.

Narayanappa D, Rajani HS, Mahendrappa and Ravikumar VG (2012). Prevalence of Asthma in Urban School Children in Jaipur, Rajasthan. *Indian Pediatrics* **49** 835-836.

Nitiu DS (2006). Aeropalynologic analysis of La Plata city (Argentina) during a 3-year period. *Aerobiologia* **22** 79-87.

Norris-Hill J and Emberlin J (1991). Diurnal variation of pollen concentration in the air of north-central London. *Grana* **30** 229-234.

Raynor GS, Ogden EC and Hayes JV (1973). Variation in ragweed pollen concentration to a height of 108 metres. *Journal of Allergy and Clinical Immunology* **51** 199-207.

Rantio-Lehtimaki A, Helander ML and Pessi AM (1991). Circadian periodicity of airborne pollen and spores; Significance of sampling height. *Aerobiologia* **7** 129-135.

Recio M, Cabezudo B, Trigo MM and Toro FJ (1996). Olea europaea pollen in the atmosphere of Malaga (S. Spain) and its relationship with meteorological parameters. *Grana* **35** 308-313.

Sahney M and Chaurasia S (2008). Seasonal variations of airborne Pollen in Allahabad, India. *Annals of Agricultural and Environmental Medicine* **15** 287-293.

Singh AB and Kumar P (2004). Aerial Pollen Diversity in India and Their Clinical Significance in Allergic Diseases. *Indian Journal of Clinical Biochemistry* **19**(2) 190-201.

Spieksma F, Th M and den Tonkelaar JE (1986). Four-hourly fluctuations in grass-pollen concentrations in relation to net versus dry weather, and to short versus long over-land advection. *International Journal of Biometeorology* **30** 351-358.

Spieksma E and Th M (1983). Fluctuations in grass-pollen counts in relation to nightly inversion and air pollution potential of the atmosphere. *International Journal of Biometeorology* **27** 107-116.

Tsou C, Tseng I, Lin R and Hong H (1997). Aeropalynological investigation in Taichung, Taiwan, 1993-1995. *Botanical Bulletin Academia Sinica* **38** 57-62.