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Research Article

PREVALENCE OF AIRBORNE POLLEN IN THE ATMOSPHERE OF THE CITY OF JAIPUR IN 2011

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ABSTRACT
Airborne pollens are important causal factor of allergic diseases such as asthma and allergic rhinitis. Therefore identification of these pollens is important. Allergic diseases are common in Jaipur so the aeropalynological survey was conducted in Jaipur city from Jan 2011to Dec 2011 using a Burkard 24Hrs volumetric sampler. Airborne Pollens were collected on a slide for 24 hour period. Slide was stained and examined under microscope. Among common pollens 41 types were identified in the one year study period. Bulk of these pollens was originated from anemophilous trees and grasses. Two major pollen seasons were recognized i.e., July to October and March to April. Highest pollen counts were obtained during August and lowest in the June. The major contributors to the pollen were Poaceae, *Cheno-Amaranthus*, Asteraceae, *Holoptelea*, *Cassia* Spp., *Brassica*, *Azadiracta* and *Parthenium*.

Key Words: *Airborne Pollen, Aeropalynological*

INTRODUCTION
Aerobiology is the study of the movement and dispersal of living or once living material such as spore and pollen. Pollen grains play an important role in airborne allergy and so is also known as allergic agent. Pollen grains are small and buoyant; they can remain airborne for hundreds of miles and this makes them highly allergic (Mendez *et al.,* 2005). Pollen allergy is a major cause of respiratory illness (Gergen *et al.,* 1992 and Maunsell *et al.,* 1971). Current aeropalynological research uses a different indicator to describe the pollen season eg. Start/end dates, daily concentration, timing and peak production.The present analysis of pollen type and their pollen season are beneficial to clinicians and allergy patients. So aeropalynological survey is essential all over the world (Celenk *et al.,* 2005; Garcia *et al.,* 2005; Rantio-Lehtimaki *et al.,* 1991 and Wodehouse *et al.,* 1935).
Jaipur, the pink city is the ultimate destination of tourist world over, many people from various parts of India and abroad visit the city. The present study will be useful for those who are hypersensitive to aerobiological pollen. Thus they can plan accordingly their tour and can escape from the incidence of allergy. The present paper deals prevalence of airborne pollen of the Jaipur city.
In Jaipur, earlier aeropalynological surveys were conducted during 1959 by Kasiwal and Solomon and later using an air sampler in 1979 by Sarna and Govil, and in 1987 B. Sharma, also did some studies but no such extensive work using the Burkard sampler was done.
The present survey has been conduct using a Burkard -24 hour volumetric sampler.
Allergic diseases are increasing in prevalence worldwide (D'Amato *et al.,* 1994; Garcia *et al.,* 2006 and Gergen *et al.,* 1992). Recently published (ISAAC) studies show quite high prevalence of allergic diseases in Jaipur area (Nair *et al.,* 1986).Environmental pollens are important trigger factors inducing asthma, rhinitis and conjunctivitis. The evidence suggests a causal relationship between exposure to pollens and exacerbation of asthma (Maunsell *et al.,* 1971). Worsening of these diseases is usually observed during the pollination season that plant species. Pollinating plant releases pollens in the environment and air disseminate it in neighboring areas.

MATERIALS AND METHODS

The Jaipur is famous as "Gulabi Nagar/Pink city" in the World**.** It is situated in 77 degree east longitude and 27 degree latitude in the north-eastern part of the Rajasthan State. This is the capital city of the State.

Pollen monitoring was performed from Jan 2011 to Dec 2011 using a Hirst-type volumetric sampler (Burkard–24hrs recording spore-trap), set at approximately 14 m above ground level on the terrace 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); 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

During the study period a total of 33400pollens (grains /m^3 was recorded by 33 pollen grain types identified during the study period. Among the annual catch the dominance of 8 pollen types (>1% of the total pollen catch) gave 29575 pollen grains/m^3 in the year. These were Cheno-Amaranthus, Poaceae, Asterace, Holoptelea, Cassia Spp., Azadirachta, Brassica, Parthenium hysteropharus.

Seasonal Variation

Monthly concentration of total pollen type and dominant type for the year (January 2011- December 2011) are illustrate in Figure 1.

Two major pollen seasons were observed: (1) July – October and (2) March – April.

Table 1: Pollen types identified from the atmosphere of jaipur city

Pollen type	Family	Season
Acacia spp.	Mimosaceae	January-December
Ageratum	Asteraceae	Throughout the year
Albizzia lebbeck	Mimosaceae	January – September
Argemone	Papaveraceae	November – May
Asphodelous	Liliaceae	December March
Azadirachta indica	Meliaceae	March- June
Bauhinia	Caesalpiniaceae	February – March
Bombax-malabaricum	Bombacaceae	March – May
Brassica Spp.	Brassicaceae	October – February
Butea monosperma	Fabaceae	February- April
Callistemon	Myrtaceae	February-March & October-November
Cassia Spp.	Caesalpiniaceae	April – June
Chenopod-Amaranthus	Amaranthaceac	July – November
Cyperus	Cyperaceae	July – December
Cynodon	Poaceae	August-December & January- April
Dalbergia	Papilionaceae	February – March
Delonix regia	Fabaceae	February – March
Euphorbia hirta	Euphorbiaceae	Throughout the year
Eucalyptus	Myrtaceae	January – April
Holoptelea	Ulmaceae	February – April
Kigelia	Bignoniaceae	April – June
Nerium indicum	Apocynaceae	April – September
Morus Alba	Moraceae	February – May
Parthenium	Asteraceae	Throughout the year
Prosopis Spp.	Fabaceae	February – May
Parkisonia aculeata	Caesalpiniaceae	January-April
Pithecellobium-dulce	Mimosaceae	February – May
Poaceae	Poeaceae	Throughout the year
Riccinus communis	Euphorbiaceae	November – April
Salvadora persica	Salvadoraceae	October –December
Tecomella undulata	Bignoniaceae	February – April
Tephrosia	Fabaceae	August – October
Ziziphus mauritiana	Rhamneaceae	September – December

Trees are the chief contributors during February to April, while weeds and grasses are the major pollen producers during August to November.

Higest pollen concentration was recorded in August (9996 pollen/m^3air). The peak occurrence of pollen grain during august was due to cheno – amaranthus.

Pollen of some stenopalynous families like Poaceae, Chenopodiaceae, Amaranthaceae and Cyperaceae were represented almost throughout the year.

The grass pollen tops the list of the total pollen flora (Tsou *et al.,* 1997).

The city of Jaipur is surrounded by the Araveli ranges, which is richly populated by the trees. Therefore the pollen of trees was trapped in high densities, during their flowering period.

In the month of June frequent sand storms cause accumulation of sand on the slides making pollen identification difficult. However, some pollen was identified. The lowest pollen count of June was due to these sand storms.

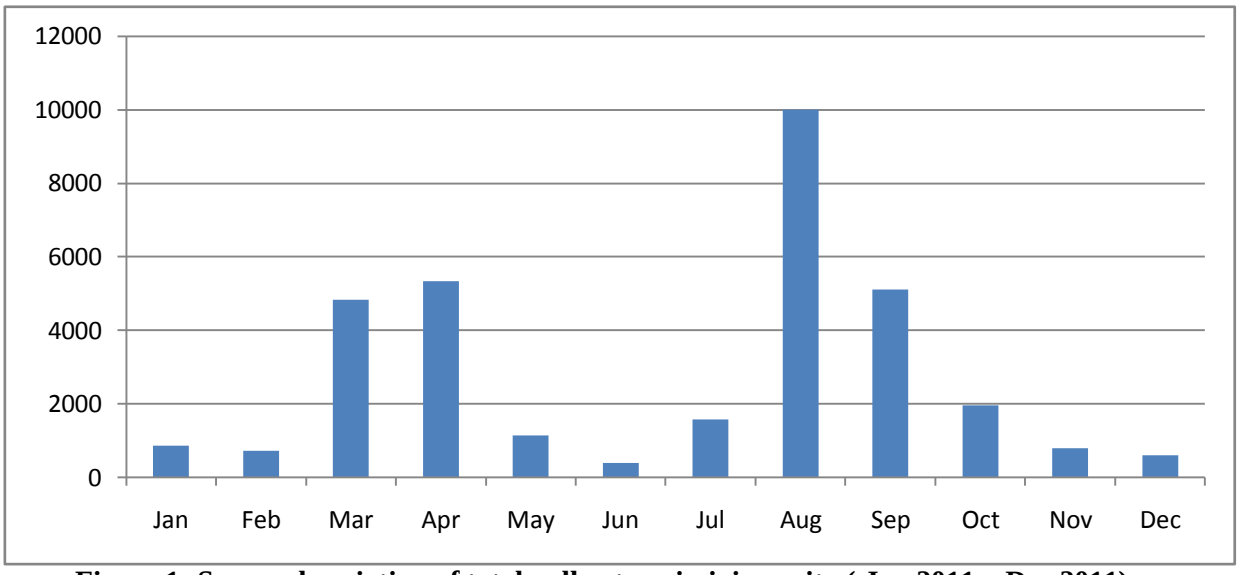

Figure 1: Seasonal variation of total pollen type in jaipur city (Jan 2011 – Dec 2011)

Relative percent contribution of dominant pollen types at Jaipur

Pollen type	**Percent Pollen Contribution**
Azadiractha	2.9
Asteraceae	8.1
Brassica	3.5
Cassia spp.	3.8
Cheno-Amaranthus	28.6
Holoptelea	4.8
Parthenium	1.35
Poaceae	35.3

Types other than these contributed less than 1%

On the basis of the observations for pollen concentration, pollen seasons of the most abundant taxa have been characterized as follows:

Poaceae: Pollen season was recorded throughout the year. The highest pollen concentrations recorded in the month of April.

Astereaece: Astereace pollen found throughout the year though the highest count was in March.

Holoptelea integrilfolia: Holoptelea integrifolia has a short pollen season, from the third week of February to the last week of March with maximum pollen concentrations in the second week of March.

Azadirachta indica: Azadirachta indica pollen season started in the first week of April and terminated in mid-May. Highest concentration recorded in the third week of April.

Brassica compestris: Pollen season of *Brassica*, was from the first week of October to the last week of March, with highest concentration in the first week of November.

Cheno-Amaranthus: The Pollen of Cheno/Amaranthus were sporadically recorded throughout the year. The major pollen season was August-November, with the highest concentration recorded in the month of August.

Parthenium hysterophorus: Parthenium recorded a long pollen season which started from March to November with higest concentration in the month of august.

Cassia Spp.: Pollen season started in the third week of April and recorded highest in the July.

No definite pollen season for Poaceae, Amaranthacea, Chenopodiaceae and other Asteraceae could be demarcated as their plants exhibit consecutive flowering patterns which keep on contributing pollen grains to the atmosphere throughout the year. *Parthenium hysterophorus* too flowers all year round showing the presence of their pollen grains in the atmosphere throughout the year (Arora *et al.*, 2001 and Chaturvedi *et al.*, 1989).

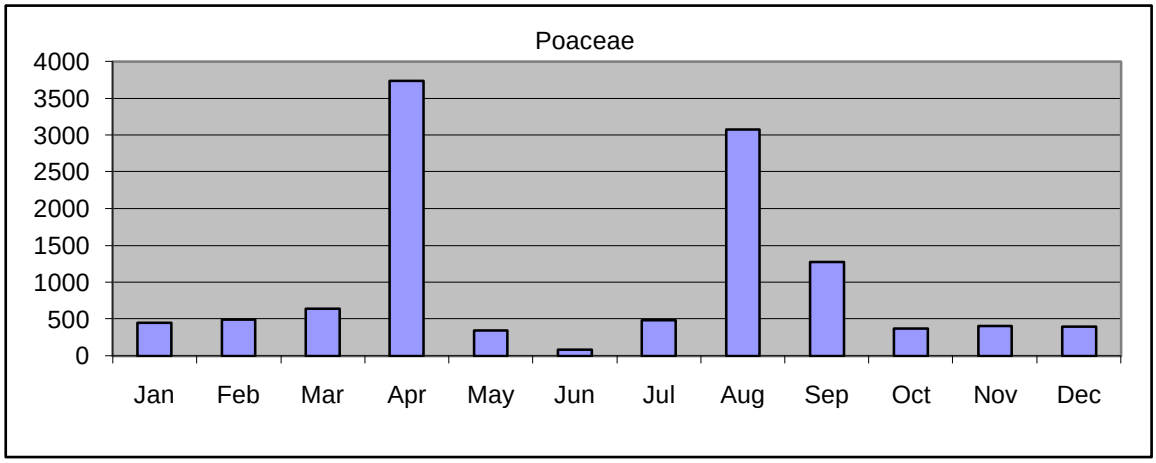

Figure 2: Monthly pollen count of poaceae

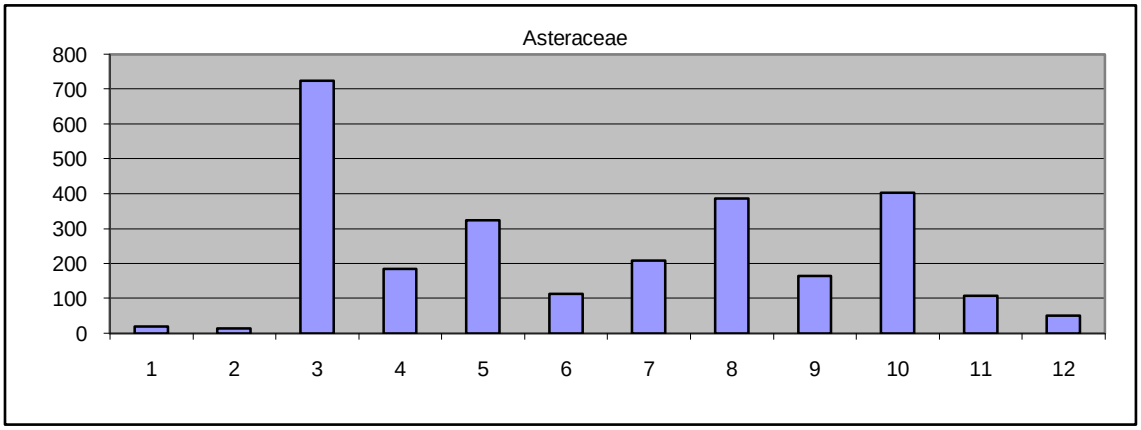

Figure 3: Monthly pollen count of asteraceae

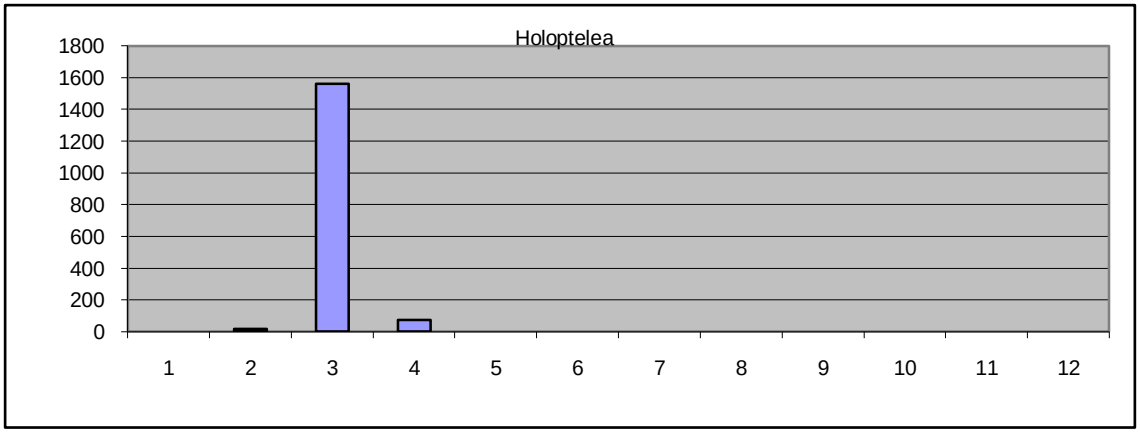

Figure 4: Monthly pollen count of *Holoptelea*

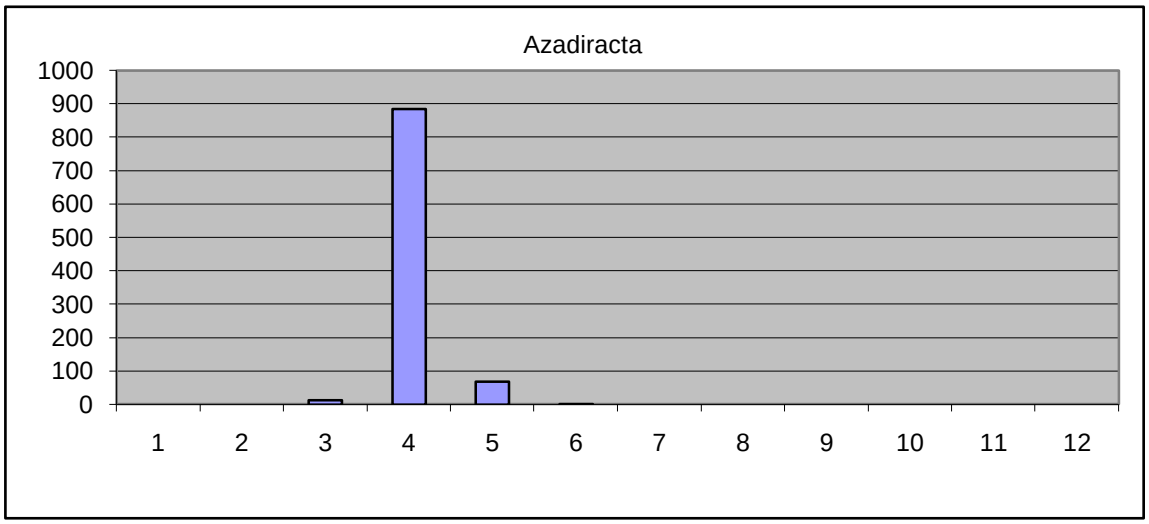

Figure 5: Monthly pollen count of *Azadiracta*

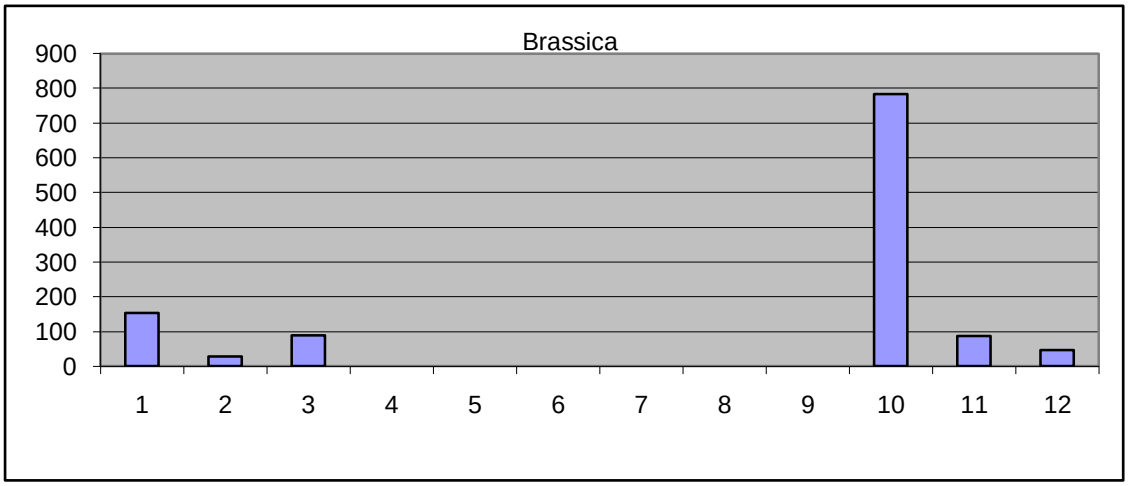

Figure 6: Monthly pollen count of *Brassica*

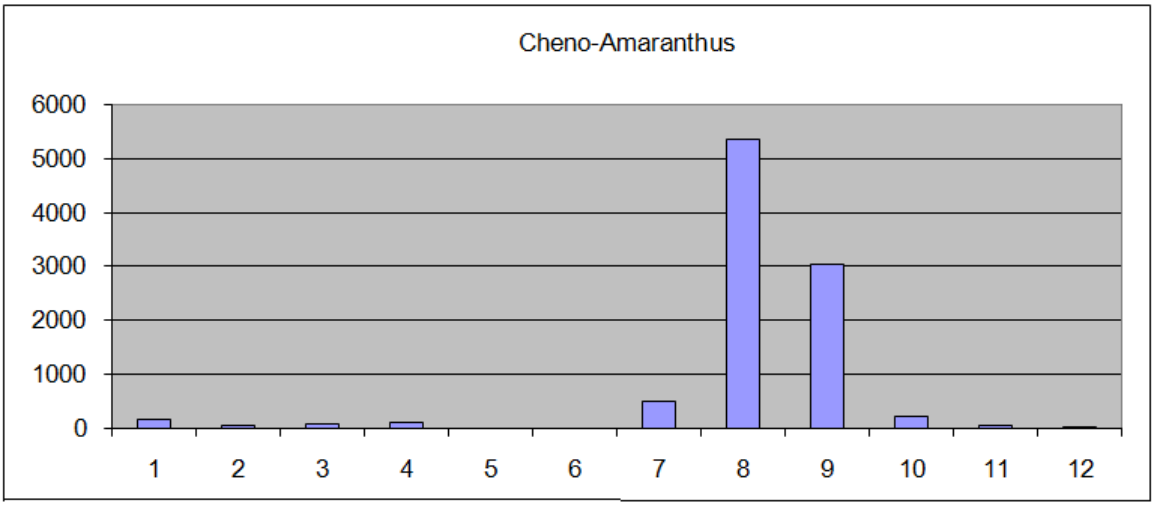

Figure 7: Monthly pollen count of cheno-amaranthus

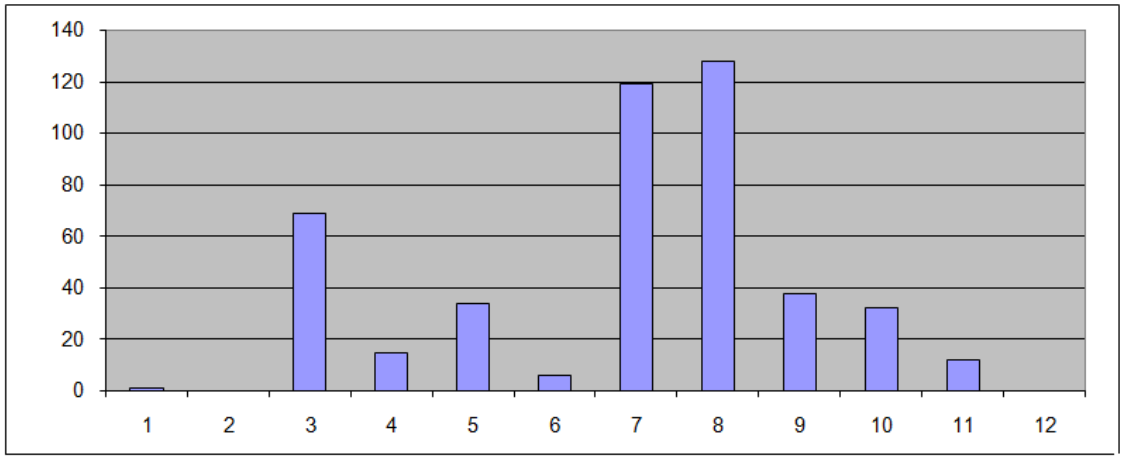

Figure 8: Monthly pollen count of *Parthenium*

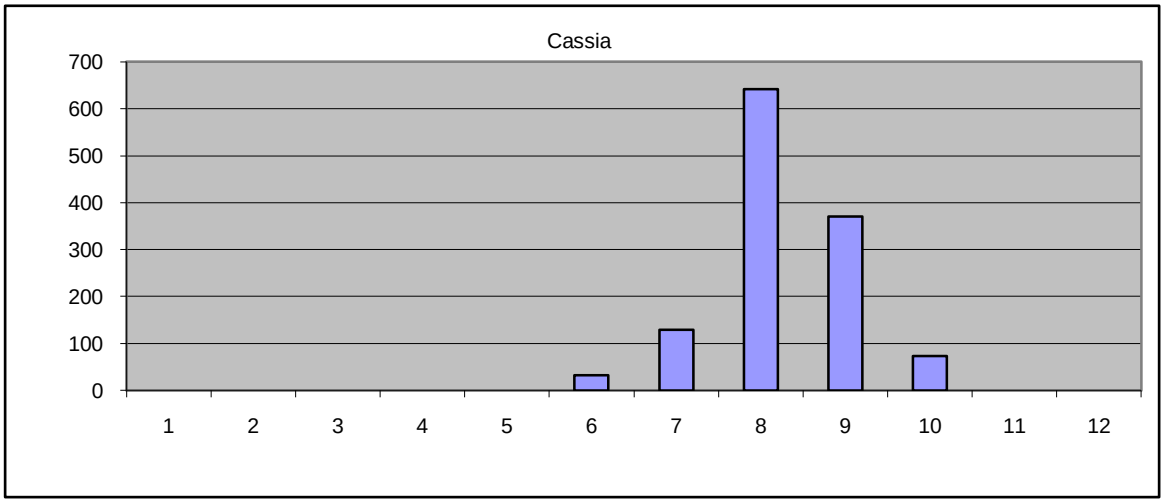

Figure 9: Monthly pollen count of *Cassia*

DISCUSSION

During the study total 41 pollen types were identified.

In Jaipur city two major pollen seasons were identified - August –October and March – April.

The pollen grains were in highest concentration during August.

Lowest occurrence was found in May – June with high temperature and low relative humidity.

Pollen counts showed a significant positive correlation with temperature and a non significant negative correlation with relative humidity.

Negative influence of rainfall and relative humidity on the pollen counts was also observed by other researchers (Kobzar *et al.*, 1990).

Pollen of Chenopodium and Amaranthus are morphologically alike and are difficult to distinguish from one another, they were grouped together as Chenopod/ Amaranth.

Conclusion

The present survey of the airborne pollen using burkard sampler has added to the knowledge of pollen grains of Jaipur. The results of this study have shown the presence of multiple allergic plant pollen in the air of Jaipur. Cheno-amaranthus, Poaceae and Asteraceae being major contributor to the air spora.

The present study will provide useful data to physician treating allergy patient for selecting pollen allergens during calendar months of the year which will help to get proper diagnosis and treatment.

This would also aid the pollen allergy patients so that they can plan accordingly their tour and can escape from the incidence of allergy.

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