Assessment of pollen of American weed *Parthenium hysterophorus* L. in the environment of University College of Science, Saifabad, Osmania University, Masab Tank, Hyderabad, T.S., India.

Abstract

The present paper deals with an atmospheric survey of the ongoing aerobiological research in University College of Science Saifabad, Osmania University, Masab Tank area, Central zone of Hyderabad, Telangana state, India. The aeroscope was installed at the terrace of Applied Palynology Research Lab, Dept. of Botany, University College of Science (UCS), Saifabad, Osmania University, Hyderabad for a period of one year, from April, 2022 to March, 2023 to furnish the qualitative and quantitative analysis of the allergenic pollen and spore and other particles of biological origin. The results showed the record of various aerosporal components from the study area and the present investigation focuses on the dominance of allergenic pollen of *Parthenium hysterophorus* which was recorded throughout the study period with good numerical frequency in the atmosphere of University College of Science Saifabad, Osmania University, Hyderabad. *Parthenium hysterophorus* is a notified aero-allergen causing type I hypersensitivity reactions and contact dermatitis which are commonly seen in human beings.

Key words*:* Aerobiology; Allergic pollen; *Parthenium* pollen: Outdoor environment; UCS Saifabad*;* Hyderabad; Telangana state; India.

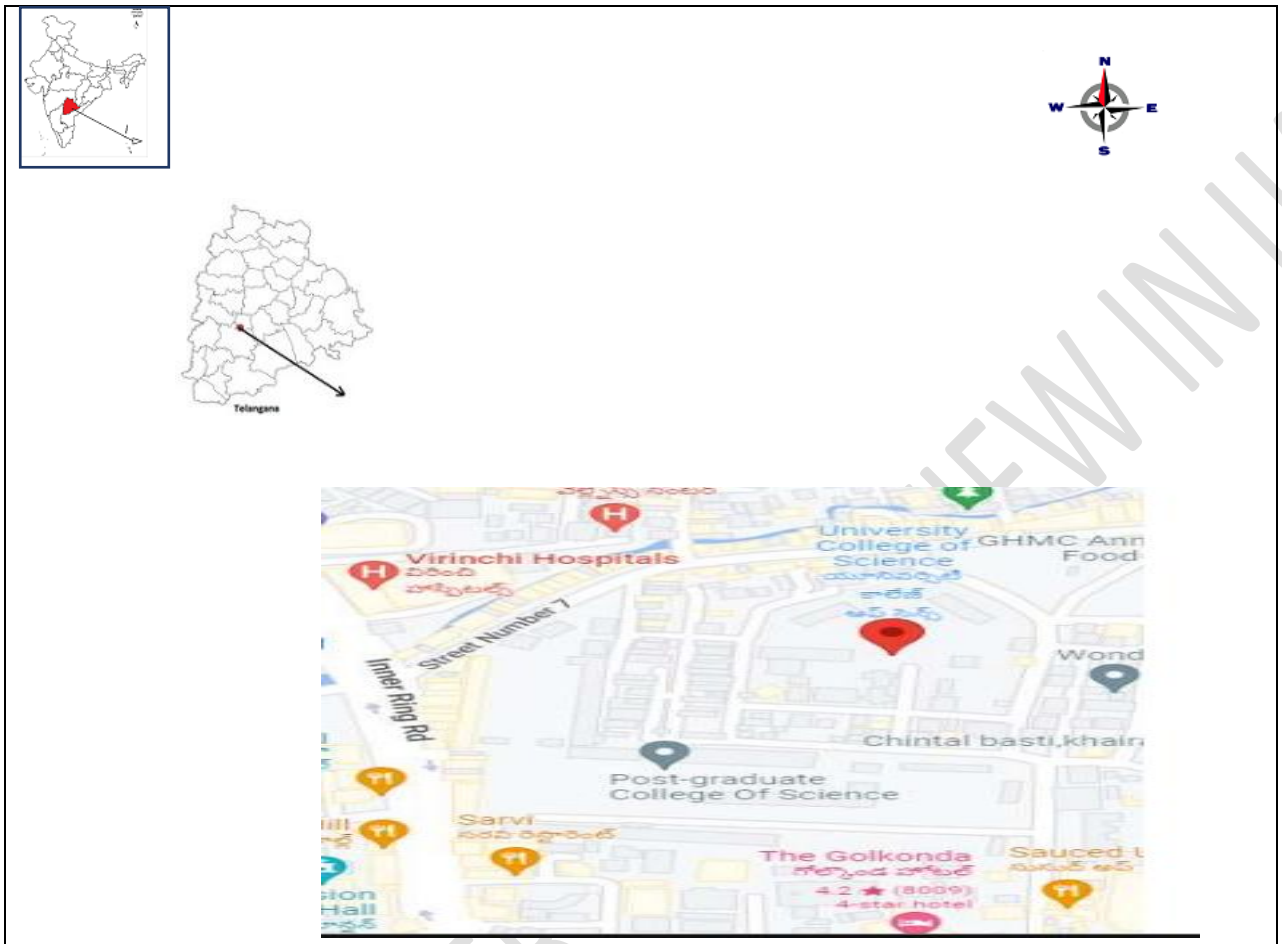
INTRODUCTION

Aerial survey is conducted to collect the aerospora from the atmosphere by suitable aeroscopes that helps us to identify the aeroallergens which causes allergic reactions. University college of Science (UCS), Saifabad which is a government constituent college of Osmania University situated in Masab Tank area of Hyderabad. The college offers both Under Graduate and Post Graduate courses with a strength of over 1400 students. The college has both old and new buildings and also consists of large and medium sized

trees, shrubs and herbs etc., contributing to the flora of the college. Efforts are made to study the air borne bio-particles of the area in order to identify the atmospheric aeroallergens of University College of Science, Saifabad, O.U., and the present paper deals with the atmospheric survey of the ongoing study during April 2022 to March 2023, highlighting a significant presence of *Parthenium hysterophorus* L. pollen in the UCS, Saifabad environment. This amphiphilic weed belongs to the family Asteraceae, is a notable aeroallergen and plays a key role in type I hypersensitivity reactions.

Materials and methods

Outdoor sampling of aerospora was carried out by gravitational aeroscope, which is a modified version of Lakhanpal and Nair's (1958). The sampler was installed at the terrace of the Applied Palynology Research Lab, University College of Science Saifabad, Osmania University Hyderabad (Map-1), at a height of about 25-30 feet from ground level, and aerial survey was conducted from April 2022 to March 2023. Three slides smeared with safranin-stained glycerin jelly were exposed per day and the exposed slides were replaced every 24 hours at 9: 30 AM. The airborne bio-particles are impacted by the wind on the greased slides. The exposed slides were then critically scanned for the aerospora. The results were quantified and analyzed. Photomicrographs of the palynomorphs were taken by using Olympus trinocular microscope attached with a digital camera.



Map - 1 showing the study area location of University College of Science Saifabad, Hyderabad, Telangana, India.

RESULTS AND DISCUSSION

Aerobiological studies conducted at University College of Science, Saifabad (UCSS, OU) during the entire period from April, 2022 to March, 2023 revealed diversified aerospora which constitutes pollen grains (57.97%) as dominant bioaerosol elements followed by

fungal spores (31.44%) and plant particles (6.92%), epidermal shreds (1.26%), fungal hyphae (1.52%), insects (0.11%), insect parts (0.75%), and algal filaments (0.02%) (Table -1). The various bioaerosols was very high representation in the month of November (12819/ 10cm^2) and least catch during the month of July (5295/ 10cm^2) (Table-1 & Fig.1). The study highlights that there was no month where the atmospheric bio-aerosols and their relative prevalence in the environment was totally free of allergenic pollen and spores and other particles of biological origin.

Out of all aerosporal elements, the pollen of *Parthenium hysterophorus* observed throughout the study period with a total annual account of 8.47%. The highest pollen peak was observed in the month of May, June and September and the least catch during the month of April, Feb, March (Fig. 2 and Table - 2) in the atmosphere of University College of Science Saifabad, Osmania University, Hyderabad.

***Parthenium hysterophorus* L:**

Parthenium hysterophorus of Asteraceae family, common called as American weed or congress grass exhibit a unique floral structure. They possess a composite flower head, known as a capitulum, which appears as a single flower but is actually a dense cluster of many small individual flowers or florets. In *Parthenium hysterophorus*, the capitulum is surrounded by an involucre of bracts. The capitulum comprises two types of florets: star-shaped ray florets, typically with five petal-like structures, and numerous tiny disc florets located in the center. The life cycle of *Parthenium hysterophorus* consists of two distinct stages: juvenile and mature. The juvenile stage is characterized by a prostrate rosette of large, dark green, pinnatisect leaves. This rosette effectively suppresses the growth of other plants by creating a dense carpet. Flowering does not occur during this phase. The mature stage of the plant develop

into a profusely branched, leafy herb with a procumbent growth habit. This stage is marked by prolific reproduction, with each plant producing approximately millions of pollen grains through wind pollination. *Parthenium hysterophorus* is remarkably adaptable, growing year-round, due to its thermo- and photo-insensitivity. It readily colonizes new areas and outcompetes native vegetation within two growing seasons and it thrives well in various soil types.

This *Parthenium hysterophorus* plant is not native to India but its pollen is wide spread comprehensively in the subcontinent over the last few decades. Tilak and Patil (1983) recorded the incidents of *Parthenium* pollen in the Atmosphere of Aurangabad during their clinical investigations and reported the significance of the *Parthenium* pollen for allergenic disorders. Chaubal and Gadve (1984), recorded *Parthenium*, *Cynodon dactylon*, *Cyperus rotandus*, *Amaranthus spinosus*, *Argemone* etc., in their survey on airborne pollen as well as clinical investigation of Kollapur area, Maharashtra and highlighted these pollen as commonly offending aeroallegens. Studies on the aerospora of Hyderabad carried out by Nayar and Ramanujam (1988-90) recorded the domination of pollen of *Parthenium hysterophorus* and grasses in the atmosphere. The recorded aerospora was proven aero-allergens and were also recorded by the earlier workers on aerobiology viz., Agashe and Abraham (1988), Reddi and Ramanujam (1989),), Nayar, Kumar and Ramanujam, (1990), Agashe, , Elfadil *et al.*, (1991), Agashe and Soucenadin (1992), Lakshmi and Srinivas 2012, Sharma and Parul Verma. 2012, Subba Rao et al., 1977, Wedner *et al.,* 1987.

Table-1. Total no. of various bioaerosols recorded at University College of Science Saifabad, OU, Hyd.,2022-23:

Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar

Total no. of various bioaerosols at UCSS, OU, Hyd.,2022-23	9324	9218	8304	5295	7249	8759	11990	17107	11070	7973	8002	9274
Percentage (%) of various bioaerosols at UCSS, OU, Hyd., 2022-23 pollen	8.21	8.12	7.31	4.66	6.38	7.71	10.56	15.06	9.75	7.02	7.05	8.17

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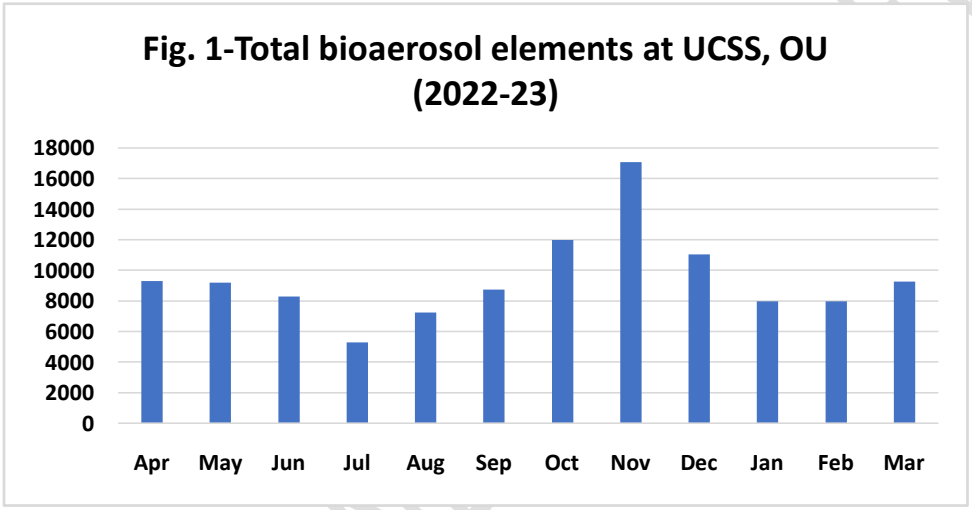

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73 **Table-2: Incidence of *Parthenium hysterophorus in the aerospora of UCS Saifabad, OU (2022-2023)***

Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar

Total no. of pollen/10 cm. sq.	4639	4384	4742	1706	3573	4848	7137	12819	5538	5084	4838	6531
No. of *Parthenium* pollen/10 cm. sq.	129	1148	1120	220	445	920	490	338	267	189	135	176
Percentage (%) contribution of *Parthenium* pollen	2.31	20.58	20.08	3.94	7.98	16.50	8.79	6.06	4.79	3.39	2.42	3.16

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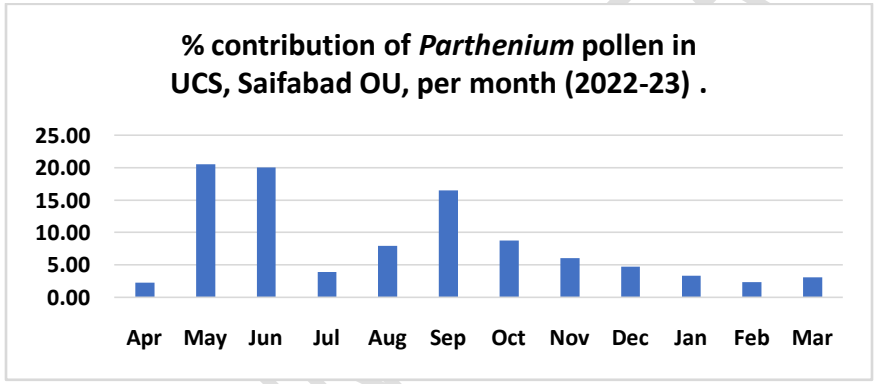
75 **Fig.2. Airborne pollen of *Parthenium* (% on total pollen count per month).**



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Conclusions

The present study highlights the dominance of allergenic pollen of *Parthenium hysterophorus* which was recorded throughout the study period with good numerical frequency in the atmosphere of University College of Science Saifabad, Osmania University, Hyderabad. *Parthenium hysterophorus* is a recognized airborne allergen causing both Type I hypersensitivity reactions and contact dermatitis (delayed allergic reactions) in susceptible individuals.

Acknowledgement

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Competing Interests

The authors declare that they have no competing interests.

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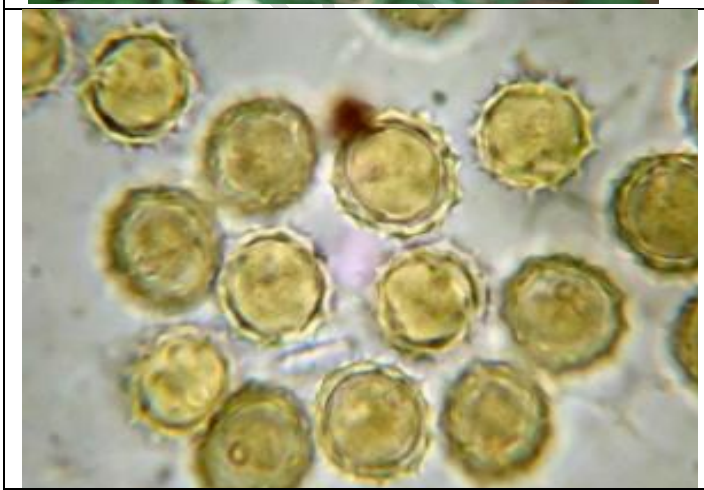
Plate-1. *Parthenium hysterophorus L* Plant and its air-borne pollen



***Parthenium hysterophorus* pollen (in group)**	***Parthenium hysterophorus* pollen grain (single)**