iJRASET
International Journal For Research in Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 5 **Issue:** XI **Month of publication:** November 2017

**DOI:**

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887*
*Volume 5 Issue XI November 2017- Available at www.ijraset.com*

# Role of Bioaerosol in Causing Allergic Infections

Sujatha Uram[1], Dr. D.Sharada[2],
[1]*Research Scholar, Dept. of Biotechnology, JNTUH,* [2]*ProfessorDept. of Bioinformatics Osmania University.*

***Abstract: Bioaerosols are particles which may be biological origin like microbes, plants, animals etc., or may be artificial like house dust,organic waste etc.,Most of the bio aerosols host on humans and moist places. Size of bio aerosol particles varies from below 1 µm to 100 µm in aerodynamic diameter. Indoor bio aerosols may originate from outdoor air and indoor reservoirs. Major sources of bacteria and viruses are humans and pets-sneezing, coughing, dander and saliva. Fungi, many bacteria, protozoa, algae and green plants (pollen) are present outdoors that are induced indoors by natural or mechanical ventilation. Bio aerosols induce into human body by inhalation or by deposition on wounds. Other common health effects of Bioaerosols are Viral: infections such as Common cold, Influenza, Measles, Bronchitis, Fungal – Histoplasmosis, Cocciodo mycosis and Blast mycosis and Antigens: Allergic diseases of Hypersensitivity pneumonitis (HP)Allergic asthma, Rhinitis and Pergolesi's Control Strategies include -After identifying the airborne microorganisms the source can either be eliminated or its strength can be reduced. Preventive maintenance is one the most effective ways to control the aerosols indoors, immunotherapy is considered to be one of the effective treatments for patients suffering from severe allergic reactions. Airsampling[2] methods have been used in the present study, to understand the amount of aerosols spread in various locations in Hyderabad and also its impact studies on allergic[3] patients.***

***Keywords: Bio aerosols, Air sampling, Allergy***

## I. INTRODUCTION

Allergy is hypersensitive reaction caused by many kinds of agents. These agents are called 'allergens' and the condition to which they take a human into is called as allergic condition or we simply say that the person has allergy or we may even say that the person is allergic to a particular allergen. Allergy is a hypersensitivity disorder of the immune system. Allergic reactions occur to normally harmless environmental substances known as allergens; these reactions are acquired, predictable, and rapid. Strictly, allergy is one of four forms of hypersensitivity and is called type I (or immediate) hypersensitivity. It is characterized by excessive activation of certain white blood cells called mast cells and basophils by a type of antibody known as IgE, resulting in an extreme inflammatory response. Type I Hypersensitivity is also known as immediate or anaphylactic hypersensitivity. Anaphylaxis typically produces many different symptoms over minutes or hours. (Figure 1) Symptoms typically include raised bumps on the skin (Figure 0; hives), itchiness, red face or skin (flushing), or swollen lips. Anaphylaxis can be caused by the body's response to almost any foreign substance. Common triggers include venom from insect bites or stings, foods, and medication. Foods are the most common trigger in children and young adults. Medications and insect bites and stings are more common triggers in older adults. Less common causes include physical factors, biological agents (such as semen), latex, hormonal changes, food additives (e.g. monosodium glutamate (MSG) and food coloring), and medications that are applied to the skin (topical medications). Exercise or temperature (either hot or cold) may also trigger anaphylaxis by causing tissue cells known as mast cells to release chemicals that start the allergic reaction. Anaphylaxis is a severe allergic reaction that starts suddenly and affects many body systems. It results from the release of inflammatory mediators and cytokines from mast cells and basophiles. This release is typically associated with an immune system reaction, but may also be caused by damage to cells that are not related to an immune reaction. When anaphylaxis is caused by an immune response, immunoglobulin E (IgE) binds to the foreign material that starts the allergic reaction (the antigen). The combination of IgE bound to the antigen activates Fc & RI receptors on mast cells and basophiles. The mast cells and basophiles react by releasing inflammatory mediators such as histamine. These mediators increase the contraction of bronchial smooth muscles, causing blood vessels to widen (vasodilatation), increase the leakage of fluid from blood vessels, and depress the actions of the heart muscle. There is also an immunologic mechanism that does not rely on IgE, but it is not known if this occurs in humans. When anaphylaxis is not caused by in immune response, the reaction is due to an agent that directly damages mast cells and basophiles, causing them to release histamine and other substances that are usually associated with an allergic reaction (degranulation). Agents that can damage these cells include contrast medium for X-rays, opioids, temperature (hot or cold), and vibration. A variety of tests now exist to diagnose allergic conditions; these include testing the skin for response to know allergens or analyzing the blood for the presence and levels of allergen specific IgE. Treatments for allergies include allergens include

allergen avoidance, use of antihistamines, steroids or other oral medications, immunotherapy to desensitize the response to allergen, and targeted therapy.

## II. REVIEW OF LITERATURE

In Hyderabad the research is also carried out in Kapra Lake, Safilguda Lake and Tank bund in which showed a high concentration of spores of Alternaria,Aspergillus etc., and this work was carried out by Ramachander Rao and his students in 2009.Research is carried out in Hyderabad on "Clinical approach to indoor and outdoor mold spores in causing allergy" and had found 37 types of spores of Aspergillus, Alternaria, Tourna, Trachoma's, Nigrosporaetc., this work was carried by Ramachander Rao and his students in 2001.In 2007 AliasAs if Ali as conducted aerobiological experiments in a semi indoor environment and isolated 32 different genera of fungi. Venkata Sai Krishna (2008) attempted an analysis of fungal bio aerosol in a semi indoor type vegetable market in Malkajgiri Hyderabad and isolated 25 different fungal spore types. In 2009 several investigators have conducted experiments in different geographical locations. Kedarinath (2009) studied airborne pollen concentration in an indoor environment. Srikanth Reddy (2009) studied pollen bio aerosols in Malkajgiri. Vine Kumar attempted pollen bio aerosols analysis of Sufilguda area. Nikhil (2009) estimated the airborne pollen concentration of the HusainSager (Tank Bund) lake.Phaninder (2009) has studied the aeromycoflora of Kara lake area and its relevance to public area, where as pollen analysis was made by Reith (2009). Vijay Krishna Kulkarni (2009) has isolated fungal aerosols from the atmosphere of popular Husainsager (Tank Bund) lake. In 2012, research was carried out in patients house on "Viable aero plankton indoors and their role in causing allergy" by Ramachander Rao and his students, and found that overall spore concentration was far higher in patients house as compared to the controls house. In a very recent study, Habeeb Ahmed and Abdul Razzed (2013) have isolated a different fungal spore types from the houses of allergic patients. LakkarajuAparna, K.Mythili, Mr.VenkataRatnam& Mrs.SujathaUram- Worked on the Air Quality Analysis in the city of Hyderabad (2015),the work was published in International Journal of Research and Innovation(IJRI).

## III. MATERIALS AND METHODS

To trap the bio aerosols, the following methods are usually employed -
Rotor air sampler
Culture plate exposure
Tape lifts sampling
Rotor air sampler:
Perkins (1957) developed a battery operated Rotorod sampler sampling at constant rotational speed since the efficiency of stationary impact or sampler is low and highly variable, the rotating impact or has been advantageously used. The collecting arms of this model are made up of brass having 0.159cm cross sectional area. It is in square shape and slightly bent inwards. The vertical arms are 6cm long and 4cm wide from the axis. According to Gregory (1951), this width should give more than 60-70% efficiency of deposition for 20um diameter spores at wind speed about 4m.p.h. The model employs miniature D.C motor with controlled speed of the type used for recorders. With the rods n proper position, the motor gives about 23,000rpm.

### *A. Collection Efficiency*

The model has been tested for efficiency and it shows 85% efficiency. The sampling efficiency for particles greater than 15µm is 100%. Wind speed has little effect in the efficiency drag and load on the motor. The Rotorod tested by carter (1965) showed 60-90% efficiency. The Restored sampler is used for short period sampling up to 2 hours. The sampler is volumetric and highly efficient. The efficiency is not affected at even high wind speed.

### *B. Mountains medium used and its preparation*

Glycerin jelly was used as the mutant, which has the best optical properties in visual examination. The composition and preparation of this are as follows

Table1: Composition of Glycerine jelly

| INGREDIENTS | QUANTITY |
|---|---|
| Gelatin | 40gm |
| Glycerin | 120gm |
| Distilled water | 140ml |
| Phenol crystals | 0.5gm |

*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887*
*Volume 5 Issue XI November 2017- Available at www.ijraset.com*

*C. Scanning*

The scanning of slides was done regularly after the preparation of slides. The conversion factor of the sampler is 5. For example, if the total number of fungal spores types are 20 for the total catch, the n the total number of fungal spores/$m^3$ of air= 5*20=100/$m^3$ of air. Assuming the taping efficiency to be 75% with the help of conversion factor, we can easily estimate the fungal spore concentration per meter cube of air. The constant factor is irrespective of locality, season and weather. All the time described in the work is given in Indian Standard Time (IST).


Figure1: Rotorod Sampler

*D. Procedure*

The samples were collected from the patient's homes by using the Rotorod sampler.

| Sample collection method | Duration of operation/ exposure |
|---|---|
| Rotorod sampler | 30-45min |

The sample were collected and then mounted and analysed under the microscope.

*E. Method of sampling*

The air sampler experiments were conducted by operating the Rotorod sampler in the patient's house. The Rotorod sampler was kept at variable height of 2-4 feet from the ground level. The transparent cello tape fixed on the two arms coated with white

petroleum jelly acts as adhesive, which permits the particles from the air to stick on the surface of the tape. The tape was changed after each sampling. The slides were prepared as described earlier and mounting was done with the help of mounting medium.

*F. Collection of The Sample At Different Geographical Locations*

The city major public junctions were selected as peoples have been suffers from various allergies that they have reported of various allergies and the cause was at to be known even after they consulted the doctor. We felt responsible and collected the sample from city major public junctions. So that awareness can be created in they and they can avoid from getting in contact with the spore types to which they are allergic Here site 1 is represented as S1; site 2 is represented as S2; site 3 is represented as S3;site 4 is represented as S4,site5 is represented as S5,site 6 represented as S6,site7 represented as S7,site 8 represented as S8,site 9 represented as S9,site 10 represented as S10.

Sampling Sites Selected in Hyderabad city

| S.No. | Site | Place |
|---|---|---|
| 1 | **S1** | Mahatma Gandhi Bus Stand |
| 2 | **S2** | Abids |
| 3 | **S3** | Charminar |
| 4 | **S4** | Uppal |
| 5 | **S5** | Dilsukhnagar |
| 6 | **S6** | RTC cross roads |
| 7 | **S7** | Paradise |
| 8 | **S8** | Panjagutta |
| 9 | **S9** | Ameerpet |
| 10 | **S10** | Kukatpally |

## IV. RESULTS

In the present investigation we have selected outdoor habitat for analyzing the various bio aerosol concentration. Outdoor habitats have been considered as the potential harbors of allergic material. Therefore, an attempt has been made in the present investigation to find out the role of outdoor airport in causing various allergies. Ten sites (named S1 to S10) have been selected for conducting outdoor aerobiological survey to ascertain the role of outdoor fungi and pollen in and around Hyderabad. Samples were collected from ten major junctions at regular intervals from 1$^{st}$April to 30$^{th}$september; altogether 180 samples were collected from the ten sites.

The fungal spores identified in the outdoor air at S1 to S10 are tabulated below

| Zygomycota | Ascomycota | Basidiomycota | Deuteromycota | Others |
|---|---|---|---|---|
| Cunnighamella | Ascospores<br>Didymosphaeria<br>Melanospora<br>Parodiella<br>Pleospora<br>Sordaria | Rust spore<br>Smut Spore | Alternaria<br>Bispora<br>Cladosporium<br>Circenella<br>Curvularia<br>Diplodia<br>Epicoccum<br>Haplosporella<br>Helminthosporium<br>Heterosporium<br>Humicola | Hyphal Fragments<br>Plant Trichomes<br>Insect scales<br>Grass pollen<br>Parthenium pollen |

| | | | | |
|---|---|---|---|---|
| | | | Nigrospora<br>Papularia<br>Periconia<br>Pithomyces<br>Tetracocosporium<br>Torula | |

Table-10a: Date and time of sample collection along with weather conditions at S10

| S.NO | Date of Sample collected | Time of Sample collected | Temperature(C) | Humidity (%) | Rainfall | Sky condition | Air condition |
|---|---|---|---|---|---|---|---|
| 1 | 20-04-2014 | 02:05 PM | 37 | 18 | No | Clear | Calm |
| 2 | 24-04-2014 | 01:09 PM | 37 | 23 | No | Clear | Calm |
| 3 | 14-05-2014 | 03:20 PM | 35 | 34 | No | Clear | Calm |
| 4 | 19-05-2014 | 02:00 PM | 41 | 23 | No | Clear | Windy |
| 5 | 22-05-2014 | 11:50 AM | 35 | 31 | No | Clear | Calm |
| 6 | 26-05-2014 | 12:30 PM | 38 | 29 | No | Clear | Windy |
| 7 | 19-06-2014 | 11:30 AM | 36 | 36 | No | Clear | Calm |
| 8 | 22-06-2014 | 12:40 PM | 37 | 31 | No | Clear | Windy |
| 9 | 26-06-2014 | 11:45 AM | 34 | 34 | No | Clear | Windy |
| 10 | 30-06-2014 | 12:03 PM | 38 | 28 | No | Clear | Windy |
| 11 | 05-07-2014 | 11:15 AM | 39 | 40 | No | Clear | Calm |
| 12 | 08-07-2014 | 11:40 AM | 51 | 35 | No | Clear | Calm |
| 13 | 16-08-2014 | 11:50 AM | 38 | 38 | No | Clear | Windy |
| 14 | 23-08-2014 | 11:50 AM | 39 | 61 | Yes | Cloudy | Windy |
| 15 | 28-08-2014 | 11:45 AM | 37 | 69 | Yes | Cloudy | Windy |
| 16 | 01-09-2014 | 12:43 PM | 38 | 38 | Yes | Cloudy | Windy |
| 17 | 14-09-2014 | 11.34AM | 35 | 42 | No | Clear | Calm |
| 18 | 18-09-2014 | 11.50AM | 37 | 45 | No | Cloudy | Windy |

| S.No | Fungal Spore Name | April | May | June | July | August | Sept | Total | % |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | Zygomycotina | | | | | | | | |
| 1 | Cunninghamella | 0 | 0 | 0 | 0 | 0 | 90 | 90 | 1 |
| | Ascomycotina | | | | | | | | |
| 2 | Ascospores | 0 | 0 | 0 | 0 | 0 | 35 | 35 | 0.4 |
| 3 | Didymosphaeria | 0 | 0 | 0 | 0 | 0 | 90 | 90 | 1 |
| 4 | Parodiella | 0 | 0 | 0 | 0 | 0 | 35 | 35 | 0.4 |
| 5 | Pleospora | 25 | 45 | 0 | 0 | 120 | 65 | 255 | 3 |
| Basidiomycotina | | | | | | | | | |
| 6 | Rust spore | 10 | 40 | 15 | 0 | 60 | 75 | 200 | 2.3 |
| 7 | Smut spore | 125 | 65 | 15 | 100 | 250 | 175 | 730 | 8.6 |
| Deuteromycotina | | | | | | | | | |
| 8 | Alternaria | 105 | 220 | 270 | 165 | 210 | 120 | 1090 | 12.8 |
| 9 | Bispora | 10 | 25 | 25 | 25 | 125 | 80 | 290 | 3.4 |
| 10 | Cladosporium | 0 | 0 | 20 | 80 | 425 | 330 | 855 | 10.1 |
| 11 | Curvularia | 20 | 55 | 80 | 40 | 125 | 175 | 495 | 5.8 |
| 12 | Diplodia | 15 | 25 | 0 | 0 | 95 | 150 | 285 | 3.3 |
| 13 | Epicoccum | 10 | 35 | 35 | 0 | 50 | 20 | 150 | 1.7 |
| 14 | Haplosporella | 0 | 0 | 0 | 0 | 35 | 170 | 205 | 2.4 |
| 15 | Helminthosporium | 0 | 5 | 0 | 50 | 125 | 190 | 370 | 4.3 |
| 16 | Humicola | 5 | 10 | 25 | 25 | 100 | 95 | 260 | 3 |
| 17 | Nigrospora | 15 | 20 | 40 | 0 | 135 | 25 | 235 | 2.7 |
| 18 | Papularia | 15 | 15 | 0 | 0 | 90 | 110 | 230 | 2.7 |
| 19 | Periconia | 0 | 0 | 0 | 25 | 235 | 205 | 465 | 5.4 |
| 20 | Pithomyces | 0 | 0 | 0 | 10 | 125 | 50 | 185 | 2.1 |
| 21 | Tetracoccosporium | 0 | 0 | 0 | 0 | 20 | 55 | 75 | 0.8 |
| 22 | Torula | 0 | 0 | 0 | 0 | 35 | 110 | 145 | 1.7 |
| | Others | | | | | | | | |
| 23 | Hyphal fragment | 70 | 175 | 125 | 70 | 155 | 185 | 780 | 9.2 |
| 24 | Insect scale | 20 | 80 | 50 | 30 | 10 | 0 | 190 | 2.2 |
| 25 | Planttrichome | 90 | 130 | 125 | 20 | 120 | 135 | 620 | 7.3 |
| 26 | Grass pollen | 0 | 20 | 10 | 0 | 40 | 20 | 90 | 1 |
| 27 | Parthenium pollen | 0 | 10 | 0 | 0 | 5 | 0 | 15 | 0.1 |
| | Total | 535 | 975 | 835 | 640 | 2690 | 2790 | 8465 | |
| | % | 6.3 | 11.5 | 9.8 | 7.5 | 31.7 | 32.9 | | 100% |

Figure10 A: Graphical representation of fungal spore concentration in S10 from Table 10b: Month wise variation in the concentration of fungal spores/m³ of air at S10 from April to September 2014

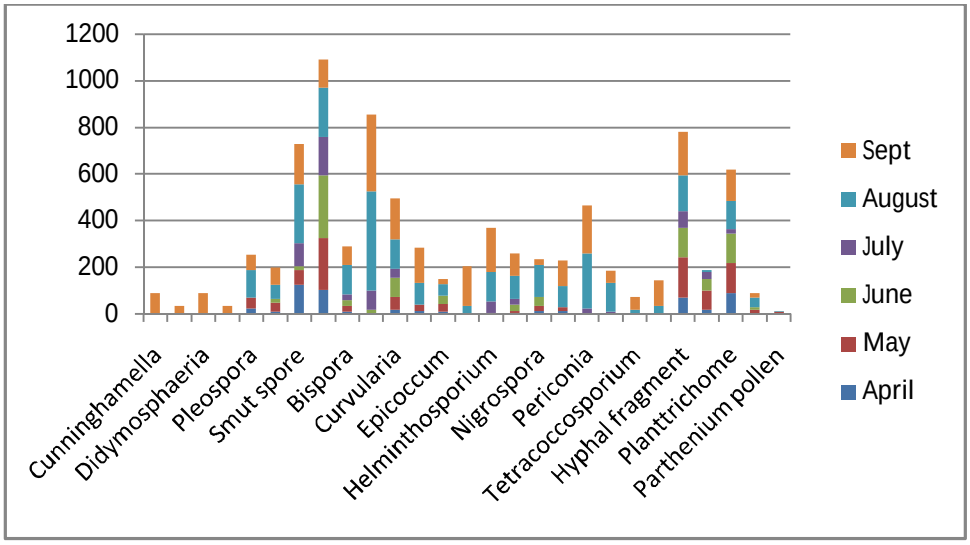
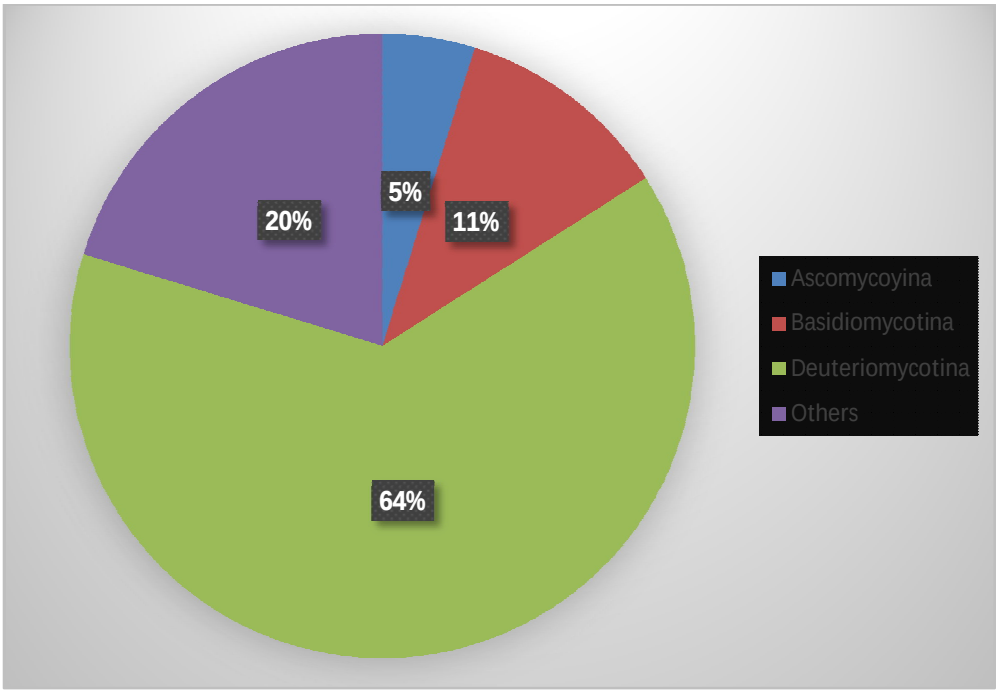
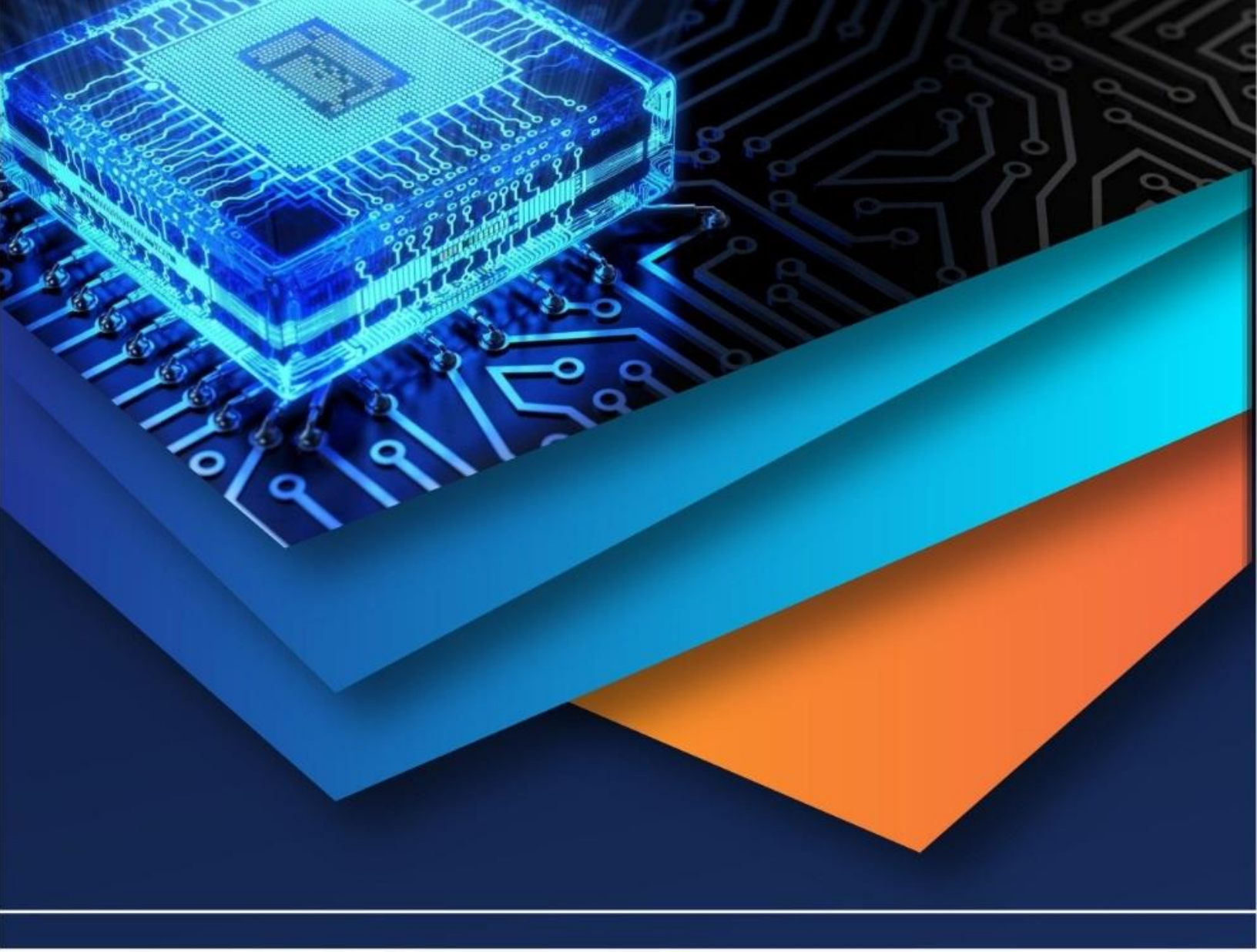



Figure10 B: Percentage contribution of fungal and other groups at S10 from April to September 2014.




## V. CONCLUSION

There is a huge variation in predominance of allergens from region to region in allergic disorders with the fact that there are topographical variations in nature. In our present study air samples were obtained by using Rotorod sampler. Alter aria and Cladosporiumwas the most dominant spore types trapped in the air of the major junction of Hyderabad, Outdoor fungal concentrations were highest in Mahatma Gandhi bus stand, Charmer, Up pal, Dilsukhnagar while the lowest value was detected in kukatpally. From April to June, Cladosporium spp. was predominant in July, Cladosporium and Alter aria were equally predominant, and in August and September Alternaria spp. was predominant. Which are known and established allergens among fungal group which are also associated with skin allergy, Sinusitis and allergic Rhinitis.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY