The air we breathe is a mixture of gases and small solid and liquid particles. Some substances come from natural sources while others are caused by human activities such as our use of motor vehicles, domestic activities, industry and other economic activities. Air pollution occurs when the air contains substances in quantities that could harm the comfort or health of human and animal, or could damage plant materials. These substances are called air pollutants and can be either particles, liquids or gaseous in nature (Alias M. et al, 2007). In India, outdoor air pollution is restricted mostly to urban areas, where automobiles are the major contributors, and to a few other areas with a concentration of industries and thermal power plants.

The major contributing factors for urban air pollution are: (1) Increased migration of population towards urban areas, (2) Industrial development & higher levels of energy consumption, (3) Increasing traffic & related issues such as poor inspection & maintenance, congestion and outdated vehicular technology, and (4) poor quality fuels.

Air pollution mostly causes respiratory disease as allergenic (runny nose, sinusitis, burning eyes, hay fever, wheezing, dry cough, shortness of breath and chest discomfort). Air pollution also include biopollutants like airborne mycoflora, phycoflora and pollen grains which severely affects the flora and fauna of the concerning areas, it’s also cause disease.
The air pollutants can be classified as primary or secondary pollutants. The primary air pollutants are harmful chemicals which directly enter the air due to natural events of human activities. A secondary air pollutant is a harmful chemical produced in the air due to chemical reaction between two or more components. That is primary pollutant combines with some component of the atmosphere to produce a secondary pollutant (Naik S., 2005).

Thermal power plants are major sources of pollution emitting variety of gaseous and particulate pollutants. SO₂, NO₂ and fly ash, Particulate matter and other compound produced during the combustion of fossil fuels and coal. Among the most common and poisonous air pollutants are Sulphur dioxide (SO₂), formed when fossil fuels such as coal, gas and oil are used for power generation; Suspended particulate matter (SPM), solid and liquid particles emitted from numerous man-made and natural sources such as industrial dust, volcanic eruptions and diesel-powered vehicles; and nitrogen oxides (NOx), from natural sources such as lightning, fires (Ahmed Hayatham, 1999).

Gases such as carbon dioxide, which contribute to global warming, have recently gained recognition as pollutants by climate scientists, while they also recognize that carbon dioxide is essential for plant life through photosynthesis. The atmosphere is a complex, dynamic natural gaseous system that is essential to support life on planet Earth. Stratospheric ozone
depletion due to air pollution has long been recognized as a threat to human health.

The present study was aimed to make a general survey about the air pollution status of small patches of the Obra Sonebhadra and in order to assess the impact of air pollution on the concentration of air biocomponent. An air pollution survey is a critical study of a particular geographical area for the purpose of determining the sources, nature and the effect of the air pollution that exists within the area concerned.

MATERIALS AND METHODS:

Initially air quality monitoring was done at five different sites in and around the Thermal Power plant area (Obra, Sonebhadra). Air samples were collected thrice a day in peak hours at monthly intervals preferably in the second and fourth weeks of each month from September 2006 to August 2008. Methods (used apparatus photographs are given in plate-4.1-4.2) and formulae to collect and calculated the suspended particulate matters (SPM), dust fall (DF), Sulphurdioxide (SO$_2$), Nitrogen dioxide (NO$_2$), Ammonia (NH$_3$) and Lead (Pb) are given below.

1. SUSPENDED PARTICULATE MATTER (SPM).

The mass concentration of suspended particulate in the ambient air is computed by measuring the mass of collect particulate and the volume of air
Air is drawn into thick polythene covered housing and through a filter by means of a high flow rate blower at a rate of 1.5 m$^3$ min$^{-1}$ that allows suspended particle having diameter of less than 100µ to pass through the filter surface. SPM were collected by drawing ambient air through a fiber glass filter paper (20 x 25 cm) by mean of a high volume sampler capable of continuous operation of 24 hrs in the high volume sampler (Envirotech APM410) the flow rate of air passing through the filter is monitored by measuring the pressure drop in rotometer. The sampler was run for 24 hrs at a suction rate of 1.5 m$^3$ min$^{-1}$ drawing a total volume of about 1500 m$^3$ of air. The concentration of SPM was obtained by measuring the total volume of air and the net weight of the deposited particle collected over the 24 hrs operation of the sampler. This method is referred to as gravimetric high volume sampling (Katz 1977).

\[
SPM (\mu g m^{-3}) = \frac{W1-W2 \times 10^6}{V}
\]

Where
- TSP = Total suspended particles.
- W1 = Initial weight (g) of filter paper.
- W2 = Final weight (g) of filter paper.
- V = Volume of air sampled (m$^3$)
2. **DUST FALL (DF):**

The dust floating in air become dense settle under force of gravity on surface of vegetation and soil and it has greater than 10 \( \mu \)m in size for the sampling. Cylindrical glass jar filled with distilled water were used. They were exposed to atmosphere to for one month. Collected samples were brought to the laboratory for further in vegetation. Residual water in the container was filtered and the residue after drying and weighting was chemically analysed (Stern, 1976) for dust fall concentration. Dust concentrations are expressed as tons Km\(^{-2}\) month \(^{-1}\).

\[
\text{Dust fall} = \frac{\text{g particles} \times 3500}{\text{Diameter of Jar (cm)}}
\]

3. **SULPHUR DIOXIDE (SO\(_2\)):**

West and Grake method is used for the measurement of SO\(_2\) concentration by sampling train. SO\(_2\) is absorbed in 0.1M Sodium tetra chloromercurate, which is converted into disulfitomercurate complex. Addition of acid bleached Pararosaniline methylsulphonic acid which is determined spectrophotometrically. Impingers with 20ml absorbent were exposed in the ambient air for four hours. Samples were brought back in the
laboratory and removed the plastic cover. Maintained the loss by additional absorbing reagent and adjusted the volume to 20ml. Add one ml sulphamic acid, 2ml Pararosaniline hydrochloride and 2ml formaldehyde. Finally maintained the level 30 ml. waited 30 minute for colour development then estimated at 560 nm. Sulphur dioxide concentration in the sample determined from the calibration curve (1ppm SO$_2$ = 2620 µg m$^3$).

\[
\text{µg SO}_2 \times 10^3 = \frac{(\text{SO}_2 \text{ g/m}^3)}{\text{Volume of air sampled (lit)}}
\]

(SO$_2$ is represented in µg SO$_2$ /m$^3$)

4. NITROGEN DIOXIDE (NO$_2$):

The NO$_2$ is collected in an (Sampling train) impinger (plate-4.1) containing the absorbing reagent, Sodiumhydroxide and Sodium arsenic. In the absorbed air sample, Hydrogenperoxide the first added to eliminate the interference of SO$_2$ by converting it into Sulphates. Colour is developed by adding sulphanitamide solution with phosphoric acid and N (1-Naphthyl) ethylenediamine dihydrochloride, intensity of the colour is measure after 10 minute by obtaining optical density at 540nm.Standard curve is made with Sodium nitrate ranging from 0.04 to 2.0 mg NO$_2$/ml. the concentration of NO$_2$ in the air calculated by following formula.
\( \mu g \text{ NO}_2 \text{ in absorbent } \times 10^3 \)

\[
\frac{(\text{NO}_2 / \text{m}^3)}{\text{Volume of air sampled } \times 0.82} = \]

5. **AMMONIA (NH}_3)\:**

Ammonia is measured through the exposure of midget impinger (plate- 4.2) containing dilute H\(_2\)SO\(_4\). After maintaining the level of absorbent added 2 ml of Nessler reagent and determined the absorbance after 10 min at 440 nm in spectrophotometer. The concentration of ammonia in the ambient air was find out by the drawing of standard curve (1 ppm NH\(_3\) =695 \(\mu gm^3\)).

6. **LEAD (Pb):**

Flame method is utilized for the analysis of lead in the sample. The pre weight exposed filter paper was punched into eight circles of 2.5 cm. these circles of known area were digested separately in 20 ml of 1% HNO\(_3\)This solution was reduced to one ml adding 15 ml HNO\(_3\) again it reduced to 1ml. one ml of concentrated HNO\(_3\) was added in this filtrate and diluted it upto 50ml. this solution was analysed for lead using atomic absorption spectrophotometer for the preparation of the calibration curve standard solution of lead was serially dilute and observation was recorded.
RESULTS AND DISCUSSION:

The seasonal variation of ambient air quality in three important seasons winter (Nov-Feb), summer (Mar-June) and Rainy (Jul-Oct) at Obra has been shown in table 4.1,4.2 &4.3. An increasing trend of pollutants was observed from September 2006 to August 2008.

The concentration of suspended particulate matter ranged from a minimum 47 µg m⁻³ in rainy at Site V (BNRS) to a maximum 902 µg m⁻³ in summer at Site I (TTPS) in year 2006-07. For the year 2007-08 the value ranged from a minimum 48 µg m⁻³ in rainy at Site V (BNRS) to maximum 912 µg m⁻³ in summer at Site I (TTPS, Fig-4.1). An increasing trend in the values of SPM was recorded from the months of March to may i.e. summer when dusty winds are the regular feature of every day.

Dust fall concentration in air varied from a minimum 6.1 tons km⁻² month⁻¹ at Site II (KVMS) in rainy to maximum 100.4 tons km⁻² month⁻¹ at Site III (BRSS) in summer season (2006-07) and minimum 6.6 tons km⁻² month⁻¹ in rainy at Site II (KVMS) to a maximum Site III (BRSS) 106.1 tons km⁻² month⁻¹ in summer season (2007-2008, Fig-4.2). Both year data clearly shows maximum dust fall during summer months followed by winter and rainy season.

Sulphurdioxide SO₂ ranged from a minimum 8.9 µg m⁻³ in rainy at Site V (BNRS) to a maximum 55.2 µg m⁻³ in winter at Site I (TTPS)
followed by Site III (BRSS) in year 2006-07(Fig-4.3). For the year 2007-08 the value ranged from a minimum 9.4 µg m⁻³ in rainy at Site V (BNRS) to maximum 56 µg m⁻³ in winter at Site I (TTPS). Highest SO₂ concentration in the air was recorded during winter season while lowest in rainy season.

The concentration of NO₂ in the ambient air varied from a minimum 9.59 µg m⁻³ in rainy at Site V (BNRS) to a maximum 79µg m⁻³ at Site I (TTPS) in winter year 2006-07 and minimum 9.23 µg m⁻³ at Site V (BNRS) in rainy to maximum 82.6 µg m⁻³ at Site I (TTPS) in winter season, (2007-08) Fig-4.4. NO₂ concentrations were usually lower during rainy and higher during winter season.

The concentration of NH₃ in the air varied from a minimum 9.02 µg m⁻³ in rainy at Site V (BNRS) to a maximum 61.8 µg m⁻³ at Site I (TTPS) in winter season year 2006-07. For the year 2007-08 this concentration ranged a minimum 8.96 µg m⁻³ at Site V (BNRS) in rainy to maximum 62.9 µg m⁻³ at Site I (TTPS) in winter season(Fig-4.5). Lowest values of Ammonia were recorded in the rainy season probably due to precipitation.

The higher values of Lead (Pb) was recorded in winter season with a maximum 0.805 µg m⁻³ and 0.84 µg m⁻³ at Site I (TTPS) for both the year i.e.2006-07 and 2007-08 respectively. However, the lowest values 0.141 and 0.013 µg m⁻³ of Pb was recorded in rainy season at Site V (BNRS) for the year 2006-07 and 2007-08(Fig-4.6).
A positive and significant ($p = < 0.001$) correlation for the SPM, $\text{SO}_2$, $\text{NH}_3$, $\text{NO}_2$ and Pb at control Site V was observed with at Site I, II, III & IV for both the year 2006-07 and 2007-08 (Chapter IX, table 9.1-9.3).

The environment was pure, virgin, undisturbed and uncontaminated in past. The environmental pollution is an undesirable changes in the physical, chemical or biological characteristics of our air, land and water that harmfully affects human life and his desirable species, industrial processes, living conditions and cultural assets (Odum 1971). Human activities produce the significant amount of solid waste and varying concentration of gases resulting in a gaseous disbalance in the atmosphere.

Polluted atmosphere is the most dangerous and injurious condition for the organisms of industrial and urban areas including the metropolitan cities like Delhi, Mumbai, Kolkatta, Kanpur, Chennai, Hyderabad, Jaipur, Ahmedabad, Nagpur and Firozabad etc. (CPCB 2002).

In order to assess the impact of air pollution on the concentrations of aerospora of Obra town and the statistical analysis of the observed date have also been made to evaluate their specific significance.