CHAPTER V

DISCUSSION
The results of the present study show that suspended particulate matter (SPM) or total suspended solid (TSS) using hi-volume Sampler is less at JNU than Moti Nagar.

Table 3. SPM changes in all four reasons during the period of study the mean value of SPM in winter season is 453.46 ug/m^3, in summer 448.356 ug/m^3, in monsoon period SPM is 488.554 ug/m^3 and in post monsoon 479.069 ug/m^3.

Maximum value of SPM is found in monsoon period at both JNU and Moti Nagar Police Station. The change in SPM is more at JNU. There is less variation at Moti Nagar than JNU and it changes in seasons.

In Moti Nagar, in winter seasons the SPM is 720.285 ug/m^3 and in postmonsoon SPM is 742.755 ug/m^3.

Table 4.

It can be seen that there is lesser percentage change at Moti Nagar when it is compared with JNU. The maximum particulate concentration for 24 hours at JNU is 838 ug/m^3 i.e. about twice the mean value in winter 596 ug/m i.e. about one and half times in summer Table 3. While in Moti Nagar the maximum particulate concentration for 24 hours in winter is 831 ug/m^3 and for summer, monsoon range is about 800 ug/m^3 or little above the mean values while in
postmonsoon it is nearly same as mean Table 3. In the period of monsoon in both the cases (JNU, Moti Nagar) SPM is higher than rest three seasons. In winter season SPM varies 62.96% at Moti Nagar in summer it varies 1.52% in monsoon 64.70% and in Post monsoon it varies 1.55% In JNU P-No3 in winter season is 0.67Ug/m³ in summer 0.543 Ug/m³ in monsoon 0.551 Ug/m³ and in postmonsoon 0.597 Ug/m³ Table-3. while at Mogi Nagar the mean value of particulate nitrate in winter season is 1.15 Ug/m³, in summer 1.008 Ug/m³, in monsoon 1.085 Ug/m³ and in Post monsoon 1.061 Ug/m³ Table 4. The nitrate ratio for MN to JNU does not remain same but it has changed in all four seasons. In winter 1.71, in summer 1.86, in monsoon 1.97 and in Postmonsoon 1.77 The maximum SPM value for the Anderson Sampler for 48 hours at JNU is 190 Ug/m³ i.e. about one and half times more than summer SPM value of JNU while at Moti Nagar maximum SPM value for 48 hours in summer and postmonsoon range about 404 Ug/m³ in postmonsoon it is nearly one and fourth times more as mean value Table 6.

In JNU, in summer the nitrate is 0.781 Ug/m³, in monsoon 0.999 Ug/m³, in postmonsoon 1.298 Ug/m³ and in winter 1.0223 Ug/m³ while at Moti Nagar the mean value of nitrate in summer season is 1.463 Ug/m³, in monsoon 1.223 Ug/m³ in postmonsoon 1.471 Ug/m³ and in winter i.e. about nearly one and fifth times more than JNU Table 6.
SPM obtained by using Anderson Sampler comparatively differs from SPM obtained by using high volume sampler. Difference in SPM from both sampler can be discussed as first High Volume sampler was used in the experiment for 24 hours at a suction rate of 1 meter cubic/minute, while Andersen sampler was used for 48 hours at a rate of 28.3 liters/minutes. There is marginal change in SPM collected by Andersen sampler in different seasons. In summer season, SPM at JNU is 117.012 Ug/m³ in monsoon 11.503 Ug/m³, in postmonsoon 110.967 Ug/m³ and in winter 111.503 Ug/m³ while at Moti Nagar in summer it is 221.940 Ug/m³, in monsoon 169.357 Ug/m³ in postmonsoon 176.659 Ug/m³ and in winter season it is 153.771 Ug/m³ It can be clearly seen that with control site SPM change is marginal but when it is compared to field site it is larger Table 6.

This means that at JNU the fine component of dust below 10 Um is constant while coarse component above 10 Um increases in summer while in Moti Nagar fine component below 10 Um also varies with season. This means that dust sources at both stations are possibly total dust collect at JNU is ranging from 55.49 Ug/m³ to 58.78 Ug/m³ while high volume sample range is 244 Ug/m³ for 24 hours.
Similarly at Moti Nagar Andersen Sampler values are from 96 μg/m³ to 404 μg/m³ while Hi-Volume sampler has 462 μg/m³ to 822 μg/m³ for 24 hours.

The particulates below of Andersen sampler has shown that the nitrates size is below 2.1 μm. In summer the nitrates value is less in comparison to monsoon at JNU while in Moti Nagar at Stage number four the nitrates quantity is more than JNU. In JNU from 10 μm to 3.3 the size of nitrates is larger it means that coarse particle is dominant while after 2.1 μm the size predominence is changing i.e. particle reaches to finer stages. See table 7. Percentage of below 2 μm size ranges from 46% to 54% at JNU in case of monsoon at JNU range is about 53% to 63%. In postmonsoon coarse particles ranges about maximum 83% to 89% at JNU while at Moti Nagar it ranges about 86% to 97%. In winter season coarse particle dominence is 22% to 80%. Similarly at Moti Nagar maximum total nitrates Percentage is 80% to 71%. Andersen sampler simulates human respiratory systems, size below 2 μm is important to discuss health hazard of a human being. This nitrates size is distributed from 2.1 μm to 0.4 μm in four stages of the Andersen sampler. For JNU means values of particle size for winter is 0.517 μm for summer, 0.473 μm for monsoon, 0.503 μm and for postmonsoon 0.550 μm indicating particles are coarser and finer. At Moti Nagar particle size (mean value) is larger than JNU, for winter. 800 μm, and for
summer 0.727 Um, for monsoon 0.726 Um, and for post-
monsoon 0.781 showing particle is coarser. Table 8.

This shows that JNU has received transported fine
nitrate particulates from other sources. Most probably
from North, North East or East or South East, as then
are no sources on soot, South West and West. Soil
nitrate contribution is found in the vicinity of Moti
Nagar experimental setup than JNU. The maximum nitrate
concentration 4.85 ppm is found in Moti Nagar and minimum
is 2.10 ppm. In JNU maximum Soil nitrate concentrations
is 3.90 ppm and minimum 0.90 ppm. It is found that there
is a great contribution of nitrate from air. It has been
seen from two sites. First site JNU for instance on close
dated 4/9/85 and 11/9/85 (September) nitrate contribution
is 1569.45 ppm on second close dated 18/12/85, 20/12/85
nitrate contribution from air is 1664.7 ppm. At Moti
Nagar on close dated 3/12/85, 7/12/85 nitrate contribution
is 1980.55 ppm, second close date (18/12/85, 20/12/85)
the nitrate contribution is 1206.96 ppm sec table 11.
The contributing role of nitrate is expected to grow as
No₂ emissions continue to increase. Nitrate occurs as NHO₃
i.e. acid nitrogenous pollutants are likely to have a
stronger effect on the acidity of precipitation, very
little has been documented concerning the role of
ammonium except that it is a recognised component of
acid precipitation. There is a correlation between the
ions No₂, and acid precipitation, but the proportions of
each will vary according to nitrogen budget and the rate of ammonical N released to the atmosphere from biological processes and from fertilizers. The concentration of NO₂ has followed maximum and minimal growth of pattern in seasons particularly in winter and monsoon seasons respectively at both the experimental sites. At JNU the maximum concentration of NO₂ is 26.108 μg/m³ in winter, minimum concentration 9.175 μg/m³ and average concentration is 16.830 μg/m³. Seasonwise the average concentration of NO₂ at JNU has gone to marginal change, in summer maximum concentration is 22.555 μg/m³, minimum 10.410 μg/m³ and the average concentration is 17.951 μg/m³, in monsoon maximum concentration is 23.769 μg/m³, minimum 13.359 μg/m³ and the average concentration 18.480 μg/m³ and in postmonsoon maximum concentration is 23.596 μg/m³ minimum 9.889 μg/m³ and the average concentration 15.630 μg/m³.

When the variation in the concentration of NO₂ is compared in maximum, minimum and average for the winter, summer, monsoon, and postmonsoon, it is found that variation is more for winter than summer, monsoon, and postmonsoon and comparatively variation is less in postmonsoon in comparison to three reasons as discussed above i.e. monsoon, summer and winter. In the year 1985 the concentration of NO₂ is found less than 1986, of course this is the normal pattern of NO₂ concentration.
At Moti Nagar the concentration range is different than JNU in all seasons. In winter season the maximum concentration is 41.640 Ug/m$^3$, minimum 28.454 Ug/m$^3$ and average 29.762 Ug/m$^3$. In summer the maximum concentration is 35.965 Ug/m$^3$, minimum 26.059 Ug/m$^3$ and the average 27.964 Ug/m$^3$. In monsoon the maximum concentration is 33.416 Ug/m$^3$, minimum 26.680 Ug/m$^3$ and the average 28.743 Ug/m$^3$. In postmonsoon the maximum concentration 30.172 Ug/m$^3$.

At Moti Nagar it is found that there is no much variations in NO$_2$ when NO$_2$ is compared in maximum, minimum and average for the reasons such as winter, summer, monsoon and postmonsoon. This shows that with respect to NO$_2$ level the ambient air quality shows seasonal and diurnal variation of effects caused by changes in both the level of activity of emission source and wind pattern. Importance of such study is to find sources and behaviour of NO$_2$ and to name technical instruments useful in optimising strategies.

Negative nitrates ratios have relationship with wind if wind is Easterly blown than nitrate ratio is negative and more nitrate is present indicating some additional source in between JNU and MN. In June 85 there is negative nitrate ration like -22.25, -38.76 and in July 85 ratios are -23.45,
-29.65, -26.56 etc. Although in the same month there is a fall in the negative nitrate ratios see table 16. In month of May 85 maximum negative ratios is -34.16 and minimum negative nitrate ratio is -0.03 here conversion is very fast. One peculiar observation is that NO₂ is getting converted into nitrate because transformation is taking place in the situation where lower negative nitrate ratio is found. In August, 1986 there is more negative nitrate ratio such as -36.52, -24.88, -32.24. Here conversion is less from NO₂ to NO₃. In September nitrate ratios are maximum showing very slow transformation or conversion from NO₂ to NO₃. See his to gram (diagram for ratio number 10).

DISTRIBUTION PATTERN

See graph for - SPM - Distribution 5 to 13. The study of the size distribution pattern of particulates was carried out at two stations, Moti Nagar and Jawaharlal Nehru University. The data obtained for the aerosols which give the actual mass concentration levels at different size, Size distribution has been presented in S.D.C NO. 5 to 13. The significance of mass diameter is to provide possible information of the origin (source) of the aerosols: natural, anthropogenic or of mixed composition. Lower values are indicative of the anthropogenic origin of aerosols, where higher mass diameter shows
dominance of natural sources. It has been reported that particulates above 2 μm in diameter are generally of crustal origin.

It has been found that distribution is of log normal and information may provide insight on the nature and behaviour of the particulates suspended. As mentioned earlier that distribution of aerosol in Delhi is highly variable and bimodal has been supported by the study carried out by Dave and Singh (1987).

The coarse mode convey specific information that Delhi aerosols's distribution pattern is dominated by particulates of crustal origin. Much of the information is more dependent upon the cascade impactor used. There is a recommendation that preseparator should be used wherever the TSP load is high enough as it reduce the bouncing of particles and reentrainment phenomenon, which may present different distribution pattern and may not become representative of all in finding the information. In summer, Delhi has dusty weather most of the time of the year specially in May and June, affecting the composition of SPM and its behaviour. In summer season one thing was peculiar that it was trimodal at JNU and MN. With peaks, indicating the difference in regional anthropogenic activity. To understand the reasons and to verify the trimodal behaviour of particulates, long term
studies should be considered with specific identification in occurrence of reasons for such patterns. Keeping in view of the National and International air quality standards for particulates present values are much higher. The values obtained at MN can be taken as reference for further evaluation.