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A Study of Ambient Air Quality of Yamuna Nagar City in Haryana

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ABSTRACT: Rapid growth in human population and extensive industrialization around the world has resulted in the degradation of environment in the last five decades. So, air quality monitoring is important to know the baseline status of various gaseous pollutants and suspended particulate matter (SPM) of any area. An air quality analysis for respirable suspended particulate matter (RSPM) and non respirable suspended particulate matter (NRSPM) of Yamuna Nagar, Haryana was carried out on three sites namely residential area, commercial area and the industrial area in the city. The two values have been added to find out the level of SPM. The value of RSPM and NRSPM were found to be higher than the limits set by National Ambient Air Quality Standards in all the three sites.

Key words: RSPM, NRSPM, Residential area, Commercial area, Industrial area.

INTRODUCTION

Quality of air is one of the basic indicators of the overall status of environment. Air pollution is a local as well as regional issue in major cities of world. Many developing and developed countries have seen progressive decline in air quality as a consequence of rapid development over the last few decades. In the cities of developing countries, the environmental problems are much greater, because of overwhelming scale and speed of urbanization. Urban areas are one of the major sources of air pollution and have characteristic patterns of pollutant emissions with adverse effect on biodiversity and seriously affect people with respiratory problems and cardiovascular diseases (Miller 1997; Mills *et al.*, 2005). Natural and anthropogenic activities including stationary sources, all contribute to air pollution (Kupchella and Hyland 1989).

Every year large quantities of toxic wastes are discharged into the environment from ever increasing production of goods and from burning of fossil fuels to generate energy needed to sustain industrial and domestic activities. In the developing countries (Ghose *et al.*, 2005) in their study concluded that air quality crisis in cities is attributed to vehicular emission which contributes to 40 to 80% of total air pollution. The major pollutants of air quality in India are the particulate matter, oxides of sulphur and nitrogen (Aggarwal & Singh, 2000). Urban air pollution due to vehicular emission is responsible for higher levels of air pollutants like SPM, RSPM, SO_2, NO_X and other organic and inorganic pollutants including trace metals and their adverse effects on human and environmental health (Aggarwal *et al.*, 2003; Caselles *et al.*, 2002; Baldasano *et al.*, 2003; Kaushik *et al.*,2006; Curtis *et al*., 2006; Barman *et al.*,2010).

India has more than twenty cities with a population of one million or more where ambient air pollution exceeds the WHO standards in many of them (Gupta *et al.*, 2002). In a survey under National Ambient Air Quality Monitoring Series (NAAQMS) by Central Pollution Control Board, air quality of seventeen cities of India was carried out. Delhi, Mumbai and Kolkata had higher levels of respirable suspended particulate matter (RSPM), while the level of NO_2 and SO_2 was found to be lower than the maximum permissible standards (CPCB 2006). Moreover, as the climate change is taking place, the air pollution problem may be worse than the present time.

Mansouri *et al.*, (2011) studied air quality parameters in Shiraz city of Iran and found that monthly concentrations of CO and PM_{10} were higher than the permissible level at some of the stations. The concentration of particulate matter was higher in warm season than cold season. In a World Bank Study (Buckland and Middletown, 1999) ambient pollution levels (SPM, SO_2, Pb & NO_2) were exceeding WHO standards in thirty six major Indian cities and towns (Gupta *et al.*, 2002).

Mohan and Kandya (2007) in their study concluded that increased traffic in Delhi has resulted into the worse air quality. Metropolitan cities in India are confronting with the problem of air pollution. A study was carried out by (Gidde, 2007) on ambient air quality in Pune regarding the concentration of lead oxide and PM_{10}.Yadav *et al*., (2012) found that the amounts of SPM and RSPM were higher than the CPCB limits in both rural and urban areas around Jhansi city of Uttar Pradesh. Ambient air quality of Rohtak (Haryana) was studied by (Shukla *et al.*, 2012). The amount of SPM in air was above the safety limits at all the sites in the city especially near the major highways.

STUDY AREA AND METHODOLOGY

The present study has been carried out at Yamuna Nagar (31°70′ N, 77°18′ E and 255m above mean sea level) which is a district headquarter in Haryana. The climate of the area is monsoonal (Singh and Yadav, 1974) with almost 90% of the rainfall received in rainy season. Three distinct seasons summer (mid March to mid June), rainy (mid June to September) and winter (October to mid March) prevail in the area.

Air sampling was carried out on weekly basis from July 2012 to June 2013 at the three sites. The selected sites from residential, commercial and industrial area. The residential area selected was of Lal Dwara- Rajdhani Colony which is one of the new settlement areas. The commercial area was main market on Jagadhri – Yamuna Nagar road. This is one of the busiest sites in the main market. The third site selected for the analysis was the industrial area in Yamuna Nagar. These three areas are at a distance of about 4 km from each other.

For the analysis of ambient air quality air samples were collected using Respirable Dust Sampler (RDS-460NL Environtech). Air was drawn into the RDS and passed through cyclone separator and glass filters (GF/A, What man).The flow rate of air was maintained between 1.1to1.3 m^3/minute. Larger particles more than 10 micron were collected in the cups attached to the cyclone. The finer particles PM_{10} (size between 2.5 to10 micron) were collected on GF/A filters. The cups and filters were dried and properly conditioned and weighed before and after the collection of air samples. The difference in weight of cups and filters before and after the collection of samples were divided by the total volume of air drawn into the RDS. This gave the concentration of non-respirable suspended particles (NRSPM from cups) and respirable suspended particulate matter (RSPM/PM_{10} from GF/A Filters) as microgram per cubic meter of air. The two values of NRSPM and RSPM have been summed up to calculate total suspended particulate matter (SPM).The values on particulate matter were averaged for each month.

RESULTS AND DISCUSSION

The observed concentrations of respirable suspended particulate matter (RSPM) and non respirable suspended particulate matter (NRSPM) from July 2012 to June 2013 for three areas have been averaged month wise and shown in Table 1 & 2 and graph 1&2.

For residential area the average monthly concentration for RSPM was found to be lowest in the month of July 2012 as 127.38μg/m^3. Its value was recorded highest in May 2013 as 249.83μg/m^3. For NRSPM the highest value of 329.85 μg/m^3 for October 2012 for the residential area has been observed.

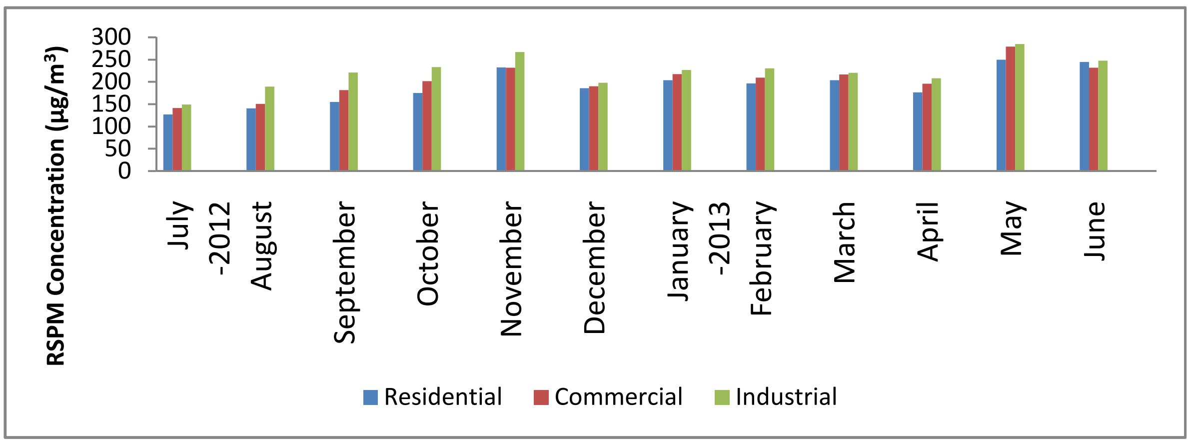
Monthly average concentration of RSPM and NRSPM (μg/m^3) in commercial areas has also been done. The highest value of RSPM was observed in May 2013.

Table 1: Monthly average concentration of RSPM and NRSPM (μg/m^3) in the residential, commercial and industrial area of Yamuna Nagar.

Month	Residential Area		Commercial Area		Industrial Area	
	RSPM	**NRSPM**	**RSPM**	**NRSPM**	**RSPM**	**NRSPM**
July(2012)	127.38	203.78	141.59	216.74	148.98	235.19
August	140.43	236.05	150.66	261.90	189.69	145.27
September	155.35	221.85	181.26	255.50	221.06	243.85
October	175.21	329.85	201.58	274.37	233.00	302.92
November	232.86	319.52	231.90	272.81	267.22	315.35
December	185.77	238.49	190.02	234.55	198.24	297.82
January(2013)	203.50	250.38	217.23	330.18	227.15	258.75
February	196.98	296.52	209.69	279.15	230.52	265.76
March	204.14	178.35	216.81	219.29	220.19	238.25
April	176.80	188.52	196.05	229.88	208.11	223.25
May	249.83	288.27	279.42	326.74	284.91	295.88
June	244.69	220.60	231.83	276.38	247.75	251.66

Table 2: Comparative monthly average and annual mean concentration of SPM (µg/m^3) in residential, commercial and industrial area of Yamuna Nagar.

Month	SPM		
	Residential	Commercial	Industrial
July(2012)	331.16	358.33	384.17
August	376.48	412.56	334.96
September	377.40	436.76	464.91
October	505.06	475.95	535.92
November	552.38	504.71	582.57
December	426.26	424.57	496.06
January(2013)	453.88	547.41	485.90
February	493.50	488.84	496.28
March	382.49	436.10	458.44
April	365.32	425.93	431.36
May	538.10	606.16	580.79
June	465.29	508.21	499.41
Annual Mean	438.94	468.79	479.22



Graph 1 : Monthly average concentration of RSPM (µg/m^3) at residential, commercial and industrial area during July 2012 to June 2013.

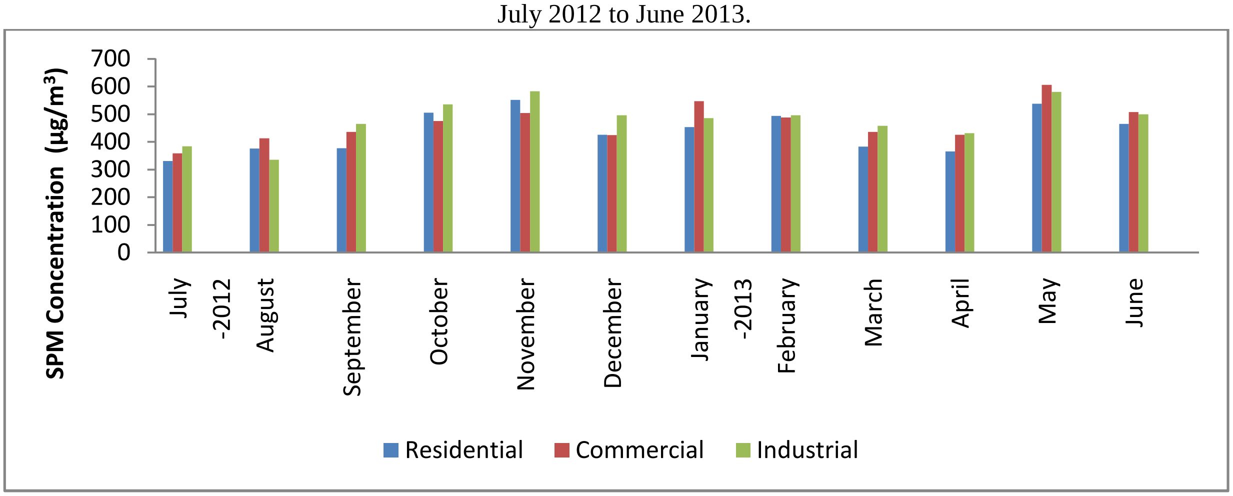


Fig. 2. Monthly average concentration of SPM (µg/m^3) at residential, commercial and industrial area during July 2012 to June 2013.

The lowest value of this particle was in the month of July 2012 as 141.59 μg/m^3. Similarly for NRSPM the lowest and highest values were recorded in the months of July 2012 and January 2013 respectively. In the month of May 2013 the value of NRSPM was quite high of 326.74μg/m^3.

In the industrial area the minimum values for RSPM and NRSPM were found to be in the month of July and August 2012 respectively (148.98 and 145.27μg/m^3). For the same particles May 2013 and November 2012 recorded the highest values.

The concentration of RSPM was lowest in the residential area in most of the months except Nov 2012 and June 2013 where it was marginally higher than commercial area. The mean annual concentration was found to be 191.25, 204.00 and 223.06 μg/m^3 for residential, commercial and industrial area respectively.

The concentration of total suspended particles (SPM) was the highest in the industrial area at most of the times. The value of SPM in commercial area was in the range of 358.33 to 606.16 μg/m^3 during July 2012 and May 2013. The annual mean value of SPM was lowest in residential area and the highest in industrial area.

On comparing the RSPM and SPM level in the three sites, it is found that commercial and industrial sites are the most polluted ones. Moreover, the value of RSPM and SPM was found to be higher than the limits set by National Ambient Air Quality Standards (NAAQS, 2009) i.e 100μg/m^3 and above the guidelines set by Central Pollution Control Board (CPCB,2011), at all the places. It has also been noticed that the concentration of particulate matter (RSPM and SPM) was lower in rainy season (July, August, and September) as compared to pre and post-rainy seasons.

Throughout the year long study, vehicular and industrial activities, quality of fuel used, condition of roads, driving habits, poor traffic management and construction activities seem to be the reasons for higher level of particulate matter in different areas. The researchers and policy makers should take the required precautions for improved living standards of the city and a pollution free environment.

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REFERENCES

Aggarwal, M. and Singh, J. (2000). Impact of coal power plant emission on the foliar elemental concentrations in plants in a low rainfall tropical region. *Environ. Monitor. Assess*. **60**: 261-282.

Aggarwal, M., Singh, B., Rajput, M., Marshall, F. and Bell, J.N.B. (2003). Effect of air pollution on peri-urban agriculture: A case study. *Environ. Poll*. **126**(3): 323-329.

Baldasano, J.M., Valera, E. and Jimenez, P. (2003). Air quality data from large cities. *The Sc. Tot. Environ*. **307**: 141-165.

Barman, S.C., Singh, R., Negi, M.P.S. and Bharagava, S.K. (2010). Assessment of urban air pollution and its probable health impacts. *J. Environ. Biol*. **31** (6): 913-920.

Buckland, A.T. and Middletown, D.R. (1999). Nomograms for calculating pollution within street canyons. *Atmos. Environ*. **22**: 1017-1036.

Caselles, J., Colliga, C. and Zornoza, P. (2002). Evaluation of trace elements pollution from vehicle emissions in Petunia plants. *Water Air Soil Pol.* **136**: 1-9.

CPCB (2006). Air quality trends and action plan for control of air pollution from seventeen cities. Central Pollution Control Board. Ministry of Environment and Forests-New Delhi.

CPCB (2011). Guideline for the measurement of ambient air pollutants vol. I. Central Pollution Control Board. Ministry of Environment and Forest, Govt. of India.

Curtis, L., Rea, W., Smith-willis, P., Fenyves, E. and Pan, Y. (2006). Adverse health effects of outdoor air pollutants. *Environ. Intern*. **39**: 3003-3013.

Ghose, M.K., Paul, R. and Banerjee, R.K. (2005). Assessment of the status of urban air pollution and its impact on human health in the city of Kolkata. *Environ. Monitor. Assess*. **108**: 151-167.

Gidde, M.R. (2007). Ambient air quality in metropolitan cities. A case study of metropolitan Pune. Bharti. Vidya. *Univ. Res*. J. **5**(2):40-47.

Gupta, H.K., Gupta, V.B., Rao, C.V.C., Gajghate, D.G. and Hasan, M.Z. (2002). Urban air quality and its management strategy for a metropolitan city of India. *Bull. Environ. Contam.Toxicol*. **68**: 347-354.

Kaushik, C.P., Ravindra, K. and Yadav, K. (2006). Assessment of ambient air quality in urban centres of Haryana (India) in relation to different anthropogenic activities and health risk. *Environ. Monitor. Assess*.**122**: 27-40.

Kupchella, C.E and Hyland, M.C. (1989). Environmental Science, Allyn and Bacon, New York.

Mansouri, B., Hoshyari, E. and Mansouri, A. (2011). Study on ambient concentrations of air quality parameters (O_3, SO_2, CO and PM10) in different months in Shiraz city Iran. *Int. J. Environ. Sc*.**1**(7): 1440-1445.

Miller, C. (1997). Toxicant induced loss of tolerance: An emerging theory of disease?. *Environ. Health. Perspec*.**105**(2): 445-453.

Mills, N.L., Amin, N., and Robinson, S.D. (2005). Do inhaled carbon nano particles translocate directly into circulation in human circulation. Assess. *J. Respir. Crit. Care Med*. **173**: 426-431.

Mohan, M. and Kandya, A. (2007). An analysis of the annual and seasonal trends of air quality index of Delhi. *Environt. Monitor. Assess*.**131**(1-3): 267-277.

NAAQS (2009). National Ambient Air Quality Standards. Central Pollution Control Board-New Delhi (India). Notification, November **18**, 2009.

Shukla, V., Dalal, P., and Choudhry, D. (2012). Impact of vehicular exhaust on ambient air quality of Rohtak city. India. *J. Environ. Biol.* **31**(6): 929-932.

Singh, J.S. and Yadav, D.S. (1974). Seasonal variation in composition, plant biomass and net primary productivity of tropical grassland at Kurukhshetra, India. *Ecol. Monogr*. **4**: 351-376.

Yadav, S.K., Kumar, V. and Singh, M.M. (2012). Assessment of ambient air quality status in urban residential areas of Jhansi city and rural residential areas of adjoining villages of Jhansi City. *Int. J. Adv. Eng. Tech.* **3**(1): 280-285.