



**ASSESSMENT OF AMBIENT AIR QUALITY
OF LUCKNOW CITY**

**DURING PRE-DIWALI,
DIWALI
AND
POST-DIWALI**

2017



सीएसआईआर-भारतीय विषविज्ञान अनुसंधान संस्थान, लखनऊ
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Assessment of Ambient Air Quality during Pre-Diwali, Diwali and Post-Diwali Festival, October 2017

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CSIR-Indian Institute of Toxicology Research (CSIR-IITR), Lucknow conducted Air Quality survey at 7 locations (Aliganj, Vikasnagar, Indiranagar, Gomtinagar, Charbagh, Aminabad and Chowk) of Lucknow city to assess the impact of fireworks on the environment during the Diwali festival, 2017. Monitoring results revealed that the respirable particulates during pre-Diwali, Diwali and post-Diwali are well above the National Ambient Air Quality Standards of 60 and 100 $\mu\text{g}/\text{m}^3$ for $\text{PM}_{2.5}$ and PM_{10} respectively (Table 1).

During the major event on Diwali night October 19th, 2017 the mean level of $\text{PM}_{2.5}$ increased from 180.3 to 316.0 $\mu\text{g}/\text{m}^3$ over the pre-Diwali night and reduced to 183.6 $\mu\text{g}/\text{m}^3$ during post-Diwali night. Similarly on Diwali night, the level of PM_{10} also increased from 257.9 to 514.8 $\mu\text{g}/\text{m}^3$ over the pre-Diwali night and reduced to 295.3 $\mu\text{g}/\text{m}^3$ during post-Diwali night. The bursting of crackers is responsible for the increasing trend of particulate levels as the other sources such as traffic and industrial activities were at the minimal contribution levels during the period on account of Diwali holidays.

On the Diwali night $\text{PM}_{2.5}$ increased by 75.3% whereas the increase in PM_{10} over the pre-Diwali night was 99.6%. Further, the higher levels of particulates continued during post-Diwali night by 1.8% and 14.5% for $\text{PM}_{2.5}$ and PM_{10} respectively over pre-Diwali night levels (Fig. 1).

In case of SO_2 and NO_2 , the mean levels were found to be within prescribed limits whereas, mean level of SO_2 on the Diwali night increased from 10.8 to 22.3 $\mu\text{g}/\text{m}^3$ and on post-Diwali mean SO_2 level was 15.8 $\mu\text{g}/\text{m}^3$, which indicates that the levels increased by 107.0% and 46.4% on the Diwali night and post-Diwali night respectively over the pre-Diwali night.

The mean level of NO_2 on Diwali night increased from 45.2 to 54.4 $\mu\text{g}/\text{m}^3$ over the pre-Diwali night. On the post-Diwali night, mean level of NO_2 was decreased to 37.9 from 45.2 $\mu\text{g}/\text{m}^3$ on pre Diwali night. In terms of percentage, NO_2 level increased by 20.4% on Diwali night and decreased by 16.2 % on post-Diwali night over the pre-Diwali night.

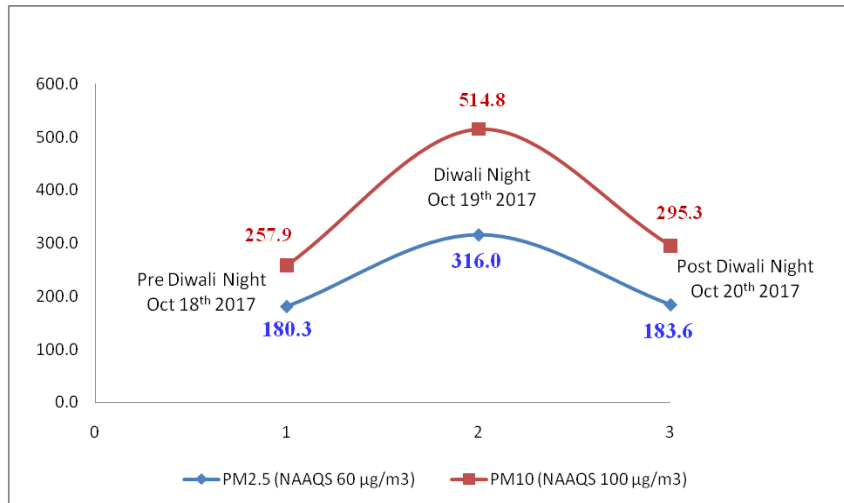


Fig. 1. Profile of respirable particulates during the night time of Diwali festival.

The meteorological conditions, particularly wind speed and directions play a major role in the transport and dispersion of the pollutants from their source. Based on CPCB monitoring data at Lalbagh, Lucknow the wind speed ranged between 0.14 to 0.91 meter per second (m/s) with an average of 0.49 m/s during 09 AM (19/10/2017) to 5 AM (20/10/2017). The prominent wind direction was ENE (East North East).

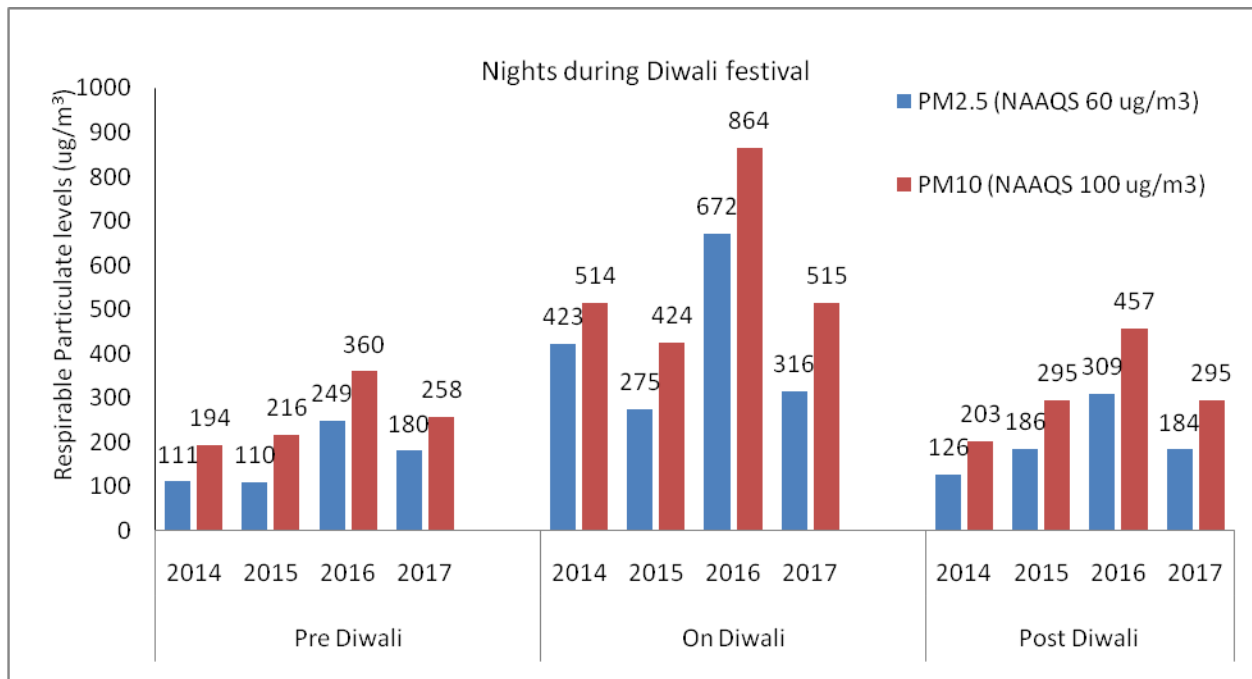


Fig. 2. Levels of respirable particulates (PM₁₀ and PM_{2.5}) concentration during 2014, 2015, 2016 and 2017 (Diwali festival).

Table 1. CSIR-IITR Diwali 2017 pollution survey

Pollutants/ Locations	pre-Diwali 2017 (October 18 th , 2017)		on-Diwali 2017 (October 19 th , 2017)		post-Diwali 2017 (October 20 th , 2017)	
	Day (6:00 am to 6:00 pm)	Night (6:00 pm to 6:00 am)	Day (6:00 am to 6:00 pm)	Night (6:00 pm to 6:00 am)	Day (6:00 am to 6:00 pm)	Night (6:00 pm to 6:00 am)
PM₁₀ (µg/m³)						
Aliganj	195.1	229.3	214.8	427.2	186.6	308.9
Vikas Nagar	190.7	307.2	239.6	752.6	167.2	313.8
Indira Nagar	202.3	224.7	208.5	548.8	196.8	318.7
Gomti Nagar	ND	246.1	202.7	422.1	176.9	291.6
Charbagh	133.0	319.4	303.1	581.4	207.8	302.7
Aminabad	226.6	254.7	246.3	494.5	177.1	290.5
Chowk	200.4	224.0	171.9	376.8	169.6	241.2
PM_{2.5} (µg/m³)						
Aliganj	117.5	163.1	149.3	297.1	128.8	177.8
Vikas Nagar	150.1	226.2	154.7	438.9	119.0	198.1
Indira Nagar	120.3	153.1	175.7	285.0	126.4	194.6
Gomti Nagar	166.1	180.4	147.6	280.8	99.5	156.8
Charbagh	173.4	233.7	162.3	401.1	128.3	211.8
Aminabad	164.1	178.6	174.8	281.3	123.9	180.5
Chowk	106.5	127.2	129.4	228.0	118.2	165.9
SO₂ (µg/m³)						
Aliganj	7.1	9.7	12.2	20.8	6.8	15.8
Vikas Nagar	10.6	12.1	8.6	31.3	7.1	18.5
Indira Nagar	12.7	13.9	10.9	25.1	10.7	17.1
Gomti Nagar	ND	8.1	11.5	21.8	6.9	14.4
Charbagh	10.7	13.3	10.8	24.0	9.8	19.3
Aminabad	9.1	8.1	11.1	19.3	7.0	13.4
Chowk	8.8	10.2	8.6	13.8	7.2	11.9
NO₂ (µg/m³)						
Aliganj	39.5	42.2	43.4	51.5	27.2	35.6
Vikas Nagar	23.5	30.2	43.0	72.4	25.1	39.1
Indira Nagar	37.4	44.0	63.6	62.9	35.1	42.2
Gomti Nagar	ND	33.8	23.3	37.9	20.9	35.9
Charbagh	78.4	71.3	90.4	67.5	38.2	46.8
Aminabad	49.5	40.1	32.9	44.3	24.6	34.2
Chowk	51.6	54.8	47.9	44.6	27.3	31.2

ND= Not Done

Noise Level

Noise level was recorded during pre-Diwali, post-Diwali and on Diwali night to observe the impact of bursting of fire cracker at following locations. The monitoring was carried out during 7 pm to midnight for near about 30 minutes at each location. The maximum noise level was recorded as 82.8 dB(A) at Vikas Nagar area whereas minimum was recorded as 70.3 dB(A) at Gomti Nagar on Diwali night. The sound waves generated from the bursting of crackers at a level higher than 80 dB(A), may damage eardrum and may induce temporary or permanent deafness. Exposure to high levels of noise may trigger problems like annoyance, irritation, hypertension, stress, hearing loss, headache and sleep disturbance. The recorded noise levels are given in Table 2.

Table 2. Noise Level on pre-Diwali, Diwali and post-Diwali night

Locations	pre-Diwali (October 18 th , 2017)	on-Diwali (October 19 th , 2017)	post-Diwali (October 20 th , 2017)
	Noise dB(A)		
Charbagh (10:0-10:30 PM)	70.3	80.1	71.5
Chowk (8:30 to 9 :00 PM)	72.1	77.9	68.9
Aliganj (10:30 to 11 PM)	66.4	78.5	68.4
Vikas Nagar (9:45-10:15 PM)	60.7	82.8	66.8
Indira Nagar (9:0-9:30 PM)	69.1	78.4	68.4
Gomti Nagar (11:30 -midnight)	64.5	70.3	62.5

The CSIR-IITR mission towards pollution free environment and minimizing/ regulating the use of crackers is an integral part of all activities/ exhibitions and programmes amongst the students, family members of staffs, general public and media persons. Air quality results observed during the year clearly indicate that the air quality of the city significantly deteriorated due to fireworks for the short period which could severely affect human health particularly in case of children, senior citizens and people with respiratory issues. In general, fire cracker contains various elements like aluminum, antimony sulphide, perchlorate, barium nitrate, lithium, copper, strontium, cadmium etc., which are responsible for causing Alzheimers' disease, thyroid, gastrointestinal problems, muscular weakness, respiratory problems, hormonal disbalance etc. It may even cause cancer. Therefore the firing of crackers should be discouraged during Diwali.