Biomaterials Journal
http://www.biomatj.com
Online ISSN: 2812-5045

*Type of the Paper (Research Article)*

# Evaluation of air quality change of udaipur city during banned crackers deepawali (2020) and unbanned crackers deepawali (2021)

**Tansukh Barupal[1,*], Shweta Bhodiwal[2], Chhagan Lal[3] and Yashwant Sompura[4]**

[1] *S.B.K. Govt. PG College, Jaisalmer, Rajasthan, India.*
[2] *Department of Botany, IIS University, Jaipur, Rajasthan, India.*
[3] *MLS Government Girls PG College, Jaisalmer, Rajasthan, India.*
[4] *Department of Botany, M.L.S. University, Udaipur-313001 Rajasthan, India*
* Corresponding author e-mail: *tansukhbarupal@gmail.com*

**Abstract:** India is a known for the land of festivals where different festivals are celebrated with great solemnity throughout the year. In India, people of all religions celebrate their festivals together, whether it is Diwali of Hindus, Eid of Muslims, Lohri of Sikhs or Christmas of Christians. All festivals in India are celebrated with joy and passion. Diwali is an important Hindu religious festival This is celebrated by the extensive burning of firecrackers which result in increasing pollution in environment. State government of Rajasthan declared strict ban on firecrackers on deepawali of year 2020 and ban was lifted on deepawali 2021. The main focus of this study is to evaluation of air quality of smart city of Rajasthan i.e. Udaipur by comparing the concentration of NH3 , NO2, NOx, SO2, NO during ban and unbanned crackers deepawali. Results showed that ubstantial increasing of the pollutants. Especially NH3 levels showed the highest i.e. 165.71% increasing followed by NO2, NOx, SO2, NO Respectively 76.39% , 44.33 %,40.01%, 2.25 and temperature increase by 2.08%.

**Keywords:** *Deepawali, firecrackers, pollution, Air quality.*

**Citation:** **Tansukh Barupal, Shweta Bhodiwal, Chhagan Lal and Yashwant Sompura** . *Evaluation of air quality change of udaipur city during banned crackers deepawali (2020) and unbanned crackers deepawali (2021)Biomat. J., 1 (3),3 – 8 (2022).*

https://doi.org/10.5281/znodo.5829408

Received: 10 February 2022

Accepted: 27 February 2022

Published: 20 March 2022



## Introduction

Deepawali is happy festival of India. Deepawali is celebrated in the month of Kartik according to Hindu calendar. There are some ancient story behind this celebrating on this day god Shri Ram along with his wife Sita and his brother Laxman returned to his native place Ayodhya from Vanvas (forest life) after defeating the demon Ravana. This fiesta is also known as ' Fesival of Lights' as it signifies the victory of light over darkness. People celebrated by the extensive burning of firecrackers which result in increasing pollution in environment. There is an on-going debate on whether and by how much does air pollution raise because of firecracker burning. Existing explore on the impact of Diwali on air quality in India has paying attention on measuring the concentration of pollutants in the air around Diwali (Mandal et al., 2012; Devara et al., 2018). For paradigm Barman et al. [2007] found average concentrations of pollutants, in Lucknow, to be 2.49 and 5.67 times higher when compared with the concentration of pre-Diwali and normal day respectively. correspondingly, air pollution caused due the burning of firecrackers during the Lantern Festival in China(Wang et al., 2007). The main goal of this study is to analyze the impact of burning crackers on the air quality of the smart city i.e. Udaipur of Rajasthan India comparing the particulate matter, carbon monoxide, nitrogen dioxide and Sulfur dioxide concentrations determined during the during ban and unbanned crackers deepawali.

## MATERIAL AND METHODS

### STUDIED AREA

Rajasthan is the largest state by area in India The state covers an area of 342,239 square kilometers (132,139 sq mi) or 10.4 percent of the total geographical area of India. It is located on the western side of the country, located between 23 30′ and 30 11′ north latitude and 69 29′ and 78 17′ east longitude. In this study we are selected beautiful smart cities i.e. Udaipur , shown in fig. 1. Udaipur is located in the southern region of Rajasthan; the main characteristics are briefly described in Table 1.

### EXPERIMENTAL DATA AND ITS ANALYSIS

In this study we have selected total four parameters i.e. PM (2.5), $NO_2$, $SO_2$, and CO concentration for assessment of air quality of Udaipur a smart city of Rajasthan. These data were obtain from automatic monitoring station i.e. Ashok Nagar, Udaipur – RSPCB, under the control of Central Pollution Control Board, New Delhi . These all data of all parameters recorded as 24 hours average period.

Experimental data obtained by selected monitoring station were analyzed with using standard statistical techniques. Comparison of each parameters i.e. obtained during the banned crackers deepawali (2020) and unbanned crackers deepawali (2021) were done by graphical representation.

## RESULTS :

Experimental data were collected of one day of deepawali of 2020 and 2021. Changes in concentrations of major pollutants during the banned crackers deepawali (2020) and unbanned crackers deepawali (2021) period are depicited in table no.2. Rajasthan government declared strict banned in the whole state on November 14, 2020. Comparison of both banned and unbanned deepawali have observed substantial increasing of the pollutants. NH3 levels showed the highest i.e. 165.71% increasing followed by NO2, NOx, SO2, NO Respectively 76.39% , 44.33 %,40.01%, 2.25 and temperature increase by 2.08%.

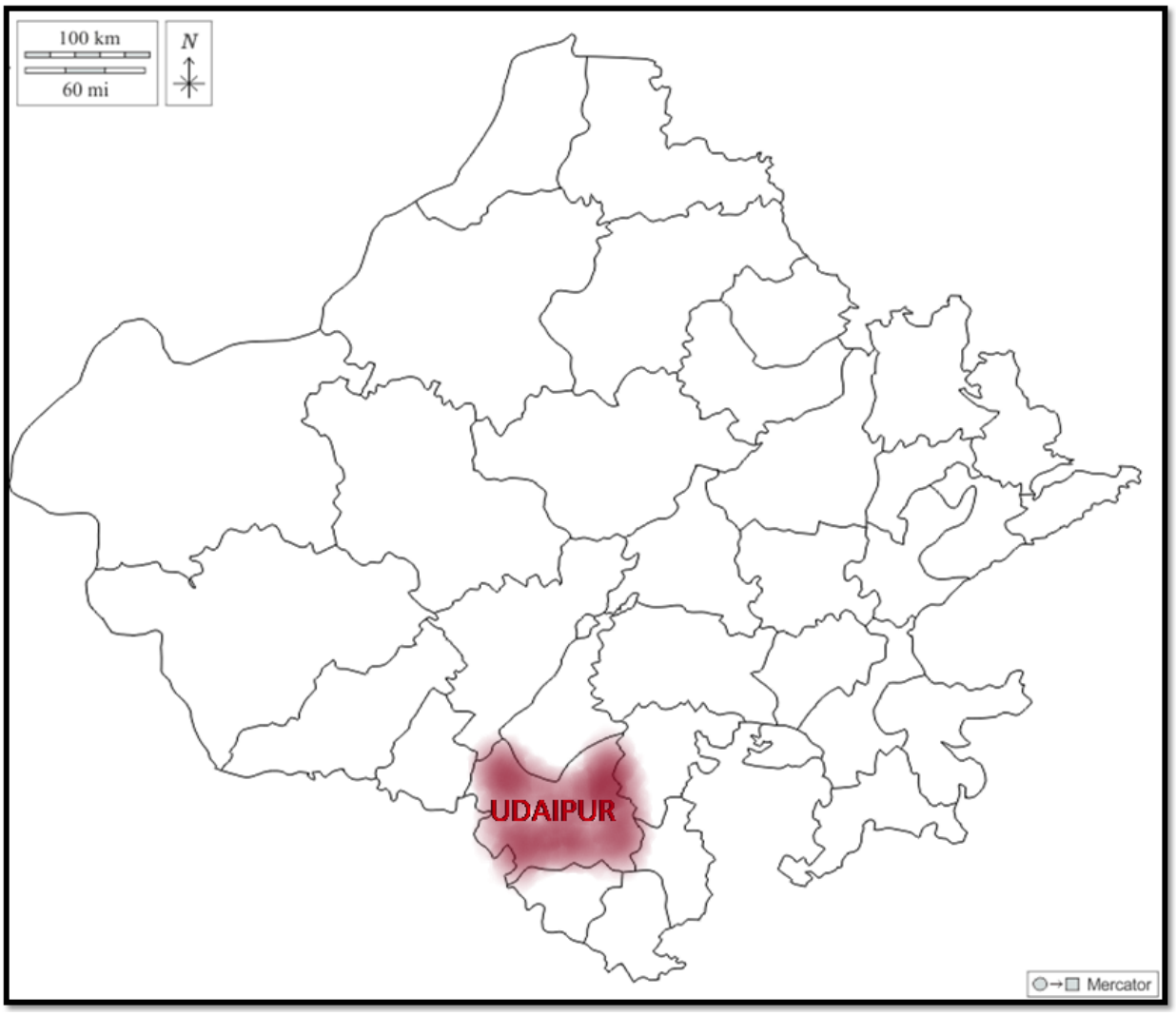


**Fig.1. Picture showing geographical location of Udaipur district in map of Rajasthan.**

**Figure 2: Burning of crackers producing smoke**

**Table 1. Description of the studied smart cities of Rajasthan, India.** (Census,2011: https://www.census2011.co.in)

| S.No. | Smart city | Coordinates | Area ($km^2$) | City Population | The monitoring station |
|---|---|---|---|---|---|
| **1.** | Udaipur | 24.5854°N, 73.7125° E | 37 | 451,100 | Ashok Nagar, Udaipur - RSPCB |

**Table 2. Contingency matrix of average concentrations of NO2, SO2, NO, NOx**

**NH3 and Temperature of Udaipur.**

| S.No. | NO2 (ug/m3) | SO2 (ug/m3) | NO (ug/m3) | NOx (ppb) | NH3 (ug/m3) | Temperature (Degree C) |
|---|---|---|---|---|---|---|
| **1. BANNED DIWALI** | 42.70 | 14.02 | 30.66 | 73.35 | 18.87 | 25.43 |
| **2. UNBANNED DIWALI** | 75.32 | 19.63 | 31.35 | 105.87 | 50.14 | 25.96 |
| **3. DIFFERENCE** | 32.62 | 5.61 | 00.69 | 32.52 | 31.27 | 00.53 |
| **4. INCREASE (%)** | **76.39** | **40.01** | **2.25** | **44.33** | **165.71** | **2.08** |

**DISCUSSION AND CONCLUSION:**

Burning of firecrackers for the period of Diwali is increasing exponentially year by year. An increasing number of middle-class families, growth of consumeristic attitudes and population growth are all contributing to the increasing usage of firecrackers. In Rajasthan Udaipur is most beautiful and famous tourist city where many outers are come Udaipur for fanfare celebrating this festival. With the increasing use of firecrackers ambient increasing the air pollutant in the environment. The air quality of this smart city was measured by the data provided by the automatic monitoring station. Impact of firecrackers on air quality of different parts of India measures tells about the how human being impact on the environment drastically (Barman, 2008; Vyas et al 2012; Chittora and Kapoor, 2015). Therefore results of the

present article possibly will help to rethink how future we are responsible for our melancholy. Article may also helpful to how firecrackers play bad role in pollutant environment and how we can restore the environment and provide the good quality ecosystem to the upcoming generations. Overall, pollutant concentrations increased in analyzed areas. In the present article included assessment of air quality during the banned crackers deepawali (2020) and unbanned crackers deepawali (2021). Our study shows a observed substantial increasing of the pollutants. Especially NH3 levels showed the highest i.e. 165.71% increasing followed by NO2, NOx, SO2, NO Respectively 76.39% , 44.33 %,40.01%, 2.25 and temperature increase by 2.08%.Therefore this study will be very useful supplement to each and everyone for thinking our present role in environment restoring or environment destruction. It will be also helpful in updating our present plan toward the assurance and conservation of nature. Consequently, for the assistance of society, it is essential to formulate appropriate strategy to control the emission and subsequent dispersion of the pollutants. Following measures might be thought of:

- Public awareness.
- Use of fire crackers should be decrease during Diwali festival as well as other days.
- People should be motivated to burst fire crackers in groups.
- Requirement of unique laws in regards to the exploding of fireworks.

**CONFLICT OF INTREST STATEMENT**

None declared

**FUNDING SOURCES**

None.

**ACKNOWLEDGEMENTS**

Authors would like to thank the Central Pollution Control Board, Ministry of Environment, Forest and Climate Change (MoEFCC) and Ministry of human resources and development, Government of India.

**References**

1. Barman SC, Singh R, Negi MPS and Bhargava SK. 2007. Ambient air quality of Lucknow city (India) during use of fireworks on Diwali festival. Environmental Monitoring and Assessment, 137(1-3):495–504.. doi: 10.1007/s10661-007-9784-1.
2. (Barman SC, Singh R, Negi MPS, Bhargava SK (2008) Ambient Air Quality of Lucknow City (India) during Use of Fireworks on Diwali Festival. Environ Monit Assess 137: 495-504.
3. Chittora AK and Kapoor CS. 2015. Status of Air Quality and Noise Level of Udaipur City, India during Diwali Festival. J Pollut Eff Cont , 3:3 DOI: 10.4172/2375-4397.1000145

4. Devara PCS, Alam MP, Dumka UC, Tiwari S, and Srivastava AK. 2018. Anomalous features of black carbon and particulate matter observed over rural station during Diwali festival of 2015. Environmental Pollution, 293–308.
5. Mandal P, Prakash M, and Bassin JK. 2012. Impact of Diwali celebrations on urban air and noise quality in Delhi city, India. Environmental monitoring and assessment, 184(1):209–215. 2012.
6. Vyas BM, Saraswat V and Lal C. 2012. Study of atmospheric black carbon aerosol over western Indian sites during Diwali festival. IASTA Bulletin,20(1,2), 126-130.
7. Wang Y, Zhuang G, Xu C, An Z.2007. The Air Pollution Caused by the Burning of Fireworks during the Lantern Festival in Beijing, China. Atmos Environ 41: 417-431.