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RESEARCH ARTICLE

SEASONAL MONITORING OF PARTICULATE MATTER ($PM_{2.5}$) IN JABALPUR (MP)

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ABSTRACT

Monitoring of $PM_{2.5}$ particularly in Jabalpur is extremely important due to their impact on the global burden of disease. Changing seasons seriously influence the use and management practices in residential/industrial built environments which subsequently affect the level of exposure to various pollutants. The measurements were carried out using BAM particulate matter instrument during winter, summer and monsoon seasons from 2014 to 2015. The variations of $PM_{2.5}$ concentrations were significant for the three seasons. During winter and summer the mean concentration of $PM_{2.5}$ was higher than monsoon season during two year study in Jabalpur area.

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INTRODUCTION

Environment will exist along with its atmosphere only. Atmosphere is made up of various gases which can supports life. The need of fresh air of atmosphere is the prime aspect for future generation. Today the atmosphere has been polluted in many ways, that may be natural or due to anthropogenic activities. The pollutants basically of two types: one is primarily or directs (CO, CO_2, NO_X, PM, CH_4 and VOCs) and other one is secondary or indirect (O_3 and smog). At present these pollutants are monitored which controlled it from any hazardous impact. But somewhere in the modern society it has unable to predict all the pollutants simultaneously and later on the increased level destruct the atmosphere which causes *"Air Pollution"*. Nobody wants to breathe or survive in the polluted air but it takes too much time to understand the pollution and forcefully habituate against this impure air. Owoade et.al (2012) studied Correlation between particulate matter concentrations and meteorological parameters at a site in Ile-Ife, Nigeria. Their results showed the seasonal variation was observed high concentrations in dry season and low in rainy season. Fensterer et al. (2014) investigated evaluation of the impact of low emission zone and heavy traffic ban in Munich (Germany) on the reduction of PM_{10} in ambient air. The reduction of PM_{10} concentration after the introduction of the measures was larger at a traffic monitoring site in summer and in winter and smaller in urban background in summer, and in winter, summer.

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SAMPLE SITE AND INSTRUMENTATIONS

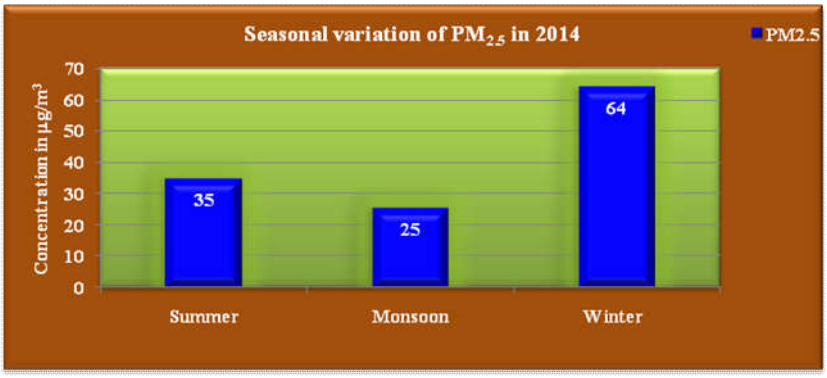
Jabalpur is one of the most important cities of Central India and it is the administrative headquarters of Jabalpur district and Jabalpur division. Location of Jabalpur in India is 23°10'N 79°56'E. Jabalpur was previously known as Jubbulpore during the Britishers Rule. The name of the city Jabalpur is basically derived from an Arabic word Jabal which means Mountain pointing to the ancient trade connection with Arab countries. The name reflects the influence of the Arab traders who visited the city during the Middle Ages.

Air Sampling and Monitoring by Ambient Air Quality Monitoring System

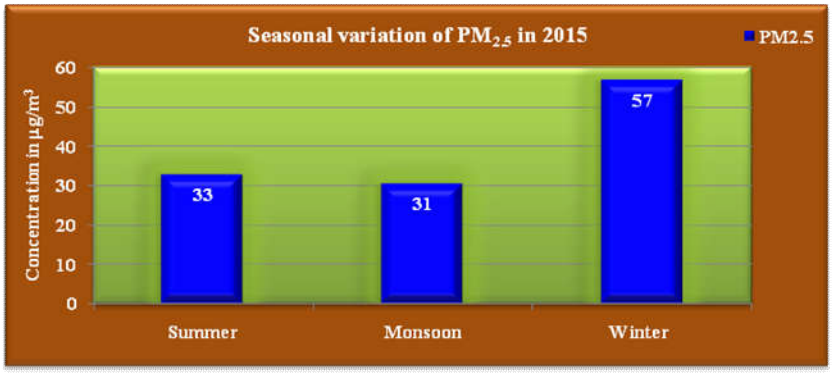
The sampling and collection of the air was done through various procedures like sampling, monitoring or survey obtaining the raw data of various ambient air parameters.

Figure (1). Instrument Installed At Govt. Model Science College, Jabalpur (MP)

Figure (2) - BAM (Beta Attenuation Monitor) Instrument



Graph (1) – Seasonal variation of $PM_{2.5}$ in 2014



Graph (1) – Seasonal variation of $PM_{2.5}$ in 2015

In Jabalpur, air quality monitoring has been continuously monitored in the research laboratory of Govt. Model Science Collage, Jabalpur (M.P.) which is used to measuring the concentration of particulate pollutants: $PM_{2.5}$. The calibration and data recording has been monitored everyday during the two year period (2014-2015). It is systematic, assessment of long term pollutants in the surroundings. *Ecotech* established the instrument for environmental monitoring that is WinAQMS (Air Quality Monitoring Station) software. This WinAQMS has two parts: the client as client and the server. The monitoring system consists of the assembly of many transducers and analyzers employing various instrumentation techniques. These are:

Particulate Matter Measurement Used Beta Attenuation Monitor Analyser (BAM)

For measuring fine particulate matter ($PM_{2.5}$**)** the Met One instruments model BAM-1020 automatically measures and records airborne particulate concentration levels using the principal of beta ray attenuation. This method provides a simple determination of concentration in units of milligrams or micrograms of particulate per cubic meter of air. A small ^{14}C (carbon 14) element emits a constant source of high-energy electrons known as beta particles. These beta particles are detected and counted by a sensitive scintillation detector. An external pump pulls a measured amount of dust-laden air through a filter tape. After the filter tape is loaded with ambient dust, it is automatically placed between the source and the detector thereby causing an attenuation of the beta particle signal. The degree of attenuation of the beta particle signal is used to determine the mass concentration of particulate matter on the filter tape, and hence the volumetric concentration of PM in ambient air.

RESULTS AND DISCUSSION

Particulate matter was monitored by the help BAM instrument in terms of different size fractions. The 24-hour average concentration of $PM_{2.5}$ was observed during two year study from 014 to 2015. The average variation in winter season of $PM_{2.5}$ was 64µg/m³ and 57µg/m³ and 35µg/m³ and 33µg/m³ in the summer season which is higher and lower value was occurred in monsoon season which was 25µg/m³ and 31µg/m³. Fine particulate matter was higher in winter due to boundary layer and in summer season shows higher value due to sand storm and anthropogenic activities in local cities. A monsoon season shows lower value due to rain. As same result got by Elbayoumi *et al.* (2013).

Conclusion

Concentration of measured $PM_{2.5}$ was less dispersed in monsoon than during the winter and summer season. Moreover, the seasonal effect on PM levels was also pronounced. Higher $PM_{2.5}$ ratios were observed in winters and summer than monsoon during two year seasonal study in Jabalpur. Being a popular tourist resort and hill station, it is important to monitor air quality at locations this location. Jabalpur observes the trends of pollutants and their subsequent levels to which tourists as well as local community may be exposed. Metrology along with anthropogenic and natural sources play major role in increases PM levels. Further long term studies are needed to explore in detail the observed seasonal variation in PM levels at such sites.

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