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THE BEHAVIOUR OF TOXIC GASEOUS POLLUTANTS (NO_2, SO_2) IN SENSITIVE AREAS OF THE NORTHWESTERN HIMALAYAN REGION A CASE STUDY OF MOHAL-KULLU AND KOTHI-MANALI

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Introduction

The concentration of gaseous pollutants like sulphur oxides, nitrogen oxides, organic carbon, black carbon, trace metals, sulphate aerosols, etc. are increasing day by day in the atmosphere from various anthropogenic activities (Gajananda, et al., 2005; Kuniyal and Bhomick, 2005; Kuniyal et al., 2006). Among the gaseous pollutants, sulphur dioxide and nitrogen dioxide are supposed to be the most important irritating and hazardous gaseous pollutants (Kuniyal et al., 2007). The effect of NO_2 and SO_2 is very toxic to human beings and plant life. The adverse health impacts due to mainly NO_2 have been widespread especially among the children showing evidences of infection in lower respiratory tract, asthmatic problems and pulmonary diseases. SO_2, the next gaseous pollutant, oxidizes in sulphate form that causes irritation to mucous membrane of respiratory tract, causes asthmatic bronchitis and other pulmonary diseases (Kuniyal et al., 2007).

Methodology

The concentration of NO_2 and SO_2 in ambient air environment was measured for 24 hours from midnight to midnight with the help of Gaseous Impingers attached with the High Volume Samplers (APM-460) installed at Mohal and Kothi in the remote locations of the northwestern Indian Himalayan region. The samples were exposed on every alternate day from January to May, 2007. These two experimental sites Mohal and Kothi are located at 1155 m and 2530 m above the mean sea level, respectively. The standard colorimetric methods were used for obtaining the concentration of NO_2 and SO_2. The Jacob and Hochheiser method for NO_2 (Jacobs and Hochheiser, 1958**)** and Modified West and Gaeke method for SO_2 (West and Gaeke, 1956) were used.

Results

The maximum concentration of SO_2 at Mohal was 6.75 μg m^{-3} in February, minimum was 0.28 μg m^{-3} in the same month and highest average value was 2.50 μg m^{-3} (Fig.1). The maximum concentration of SO_2 at Kothi was 4.63 μg m^{-3} in May 2007, minimum was sometimes below this value and highest average value was 1.62 μg m^{-3}. The maximum concentration of NO_2 at Mohal was 3.93 μg m^{-3} in month of February, minimum was 0.46 μg m^{-3} in the month of March and its highest average value was 2.33 μg m^{-3} (Fig.2). The maximum concentration of NO_2 at Kothi was 2.14 μg m^{-3} in the month of

May, minimum was 1.1 µg m^{-3} in the month of May and its highest average was 1.52 µg m^{-3}.

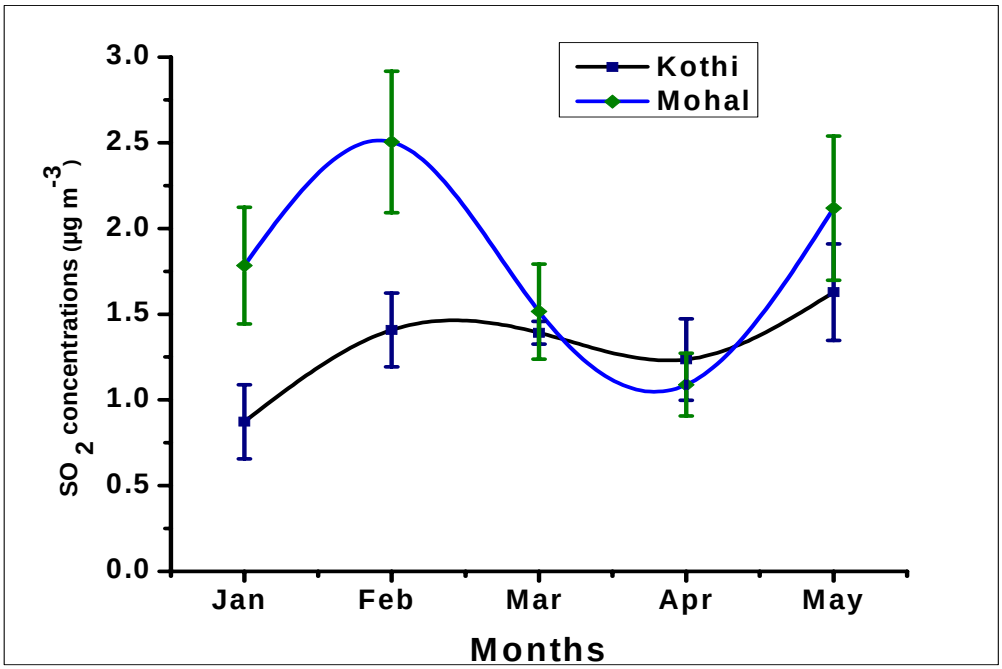

Fig. 1. Sulphur dioxide concentrations at Mohal and Kothi in the northwestern Himalaya

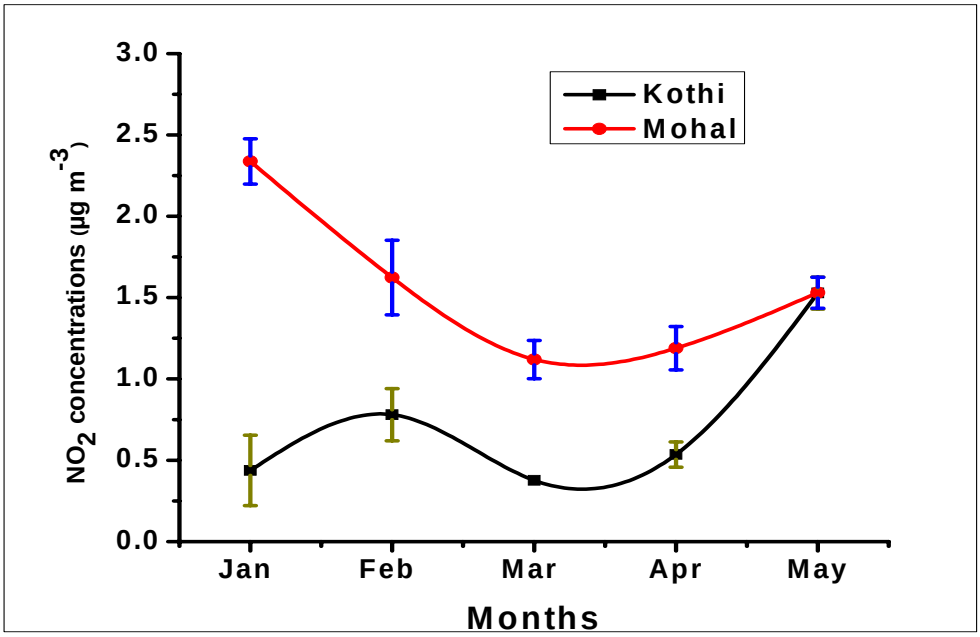

Fig. 2. Nitrogen dioxide concentrations at Mohal and Kothi in the northwestern Himalaya

Conclusions

The concentration of SO_2 and NO_2 are within permissible limits set by the United States Environmental Protection Agency (USEPA) as well as the Central Pollution Control Board (CPCB) standards. The increased level of SO_2 and NO_2 at Mohal is due to more tourism activities, biomass burning, forest fires, rising fumes from oil depot (in case of Mohal), open waste burning sometimes in municipal waste collection points and prevalent sulphur springs in the region.

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