



Responses of some herbaceous road-side wild plant species against ambient particulate pollution (PM₁₀): A case study from Malda district, West Bengal

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Abstract

The aim of this study was to evaluate the responses of herbaceous plants in dust capturing potential (DCP) and leaf functional traits under ambient PM₁₀ pollution alongside SH-10 in Malda district. The study was carried out during the post-monsoon and pre-monsoon of 2019 and assessed that the 24 h average concentration of PM₁₀ was 88.6, 87.4 and 121.9 µg.m⁻³ during January, February and March, 2019, respectively and exceeded the National Ambient Air Quality Standards (100 µg.m⁻³) only in March, 2019. The vegetation study revealed that the sequence of dominating species are *Hemigraphis birta* (IVI - 38.4) followed by *Croton bonplandianus* (IVI - 8.4), *Ageratum conyzoides* (IVI - 8.1), *Mikania micrantha* (IVI - 7), *Chrysopogon zizanioides* (IVI - 5.9), *Achyranthes aspera* (IVI - 5.1), *Pouzolzia zeylanica* (IVI - 3.8), *Euborbia birta* (IVI - 3.6), *Oxalis corniculata* (IVI - 2.9), *Centella asiatica* (IVI - 2.6), *Anisomeles indica* (IVI - 2.3), *Rumex dentatus* (IVI - 2) and *Chrozophora rotleri* (IVI - 1.9) whereas the least dominating species are *Argemone mexicana* (IVI - 0.5), *Passiflora foetida* (IVI - 0.7), *Amaranthus viridis* (IVI - 0.7) and *Leucas aspera* (IVI - 0.9). The study measures and compares the capabilities of these plants to accumulate and retain the PM. DCP of *M. micrantha* was highest (7 mg/cm²), and of *A. aspera* and *O. corniculata* lowest (0.03 mg/cm²). Here, leaf functional traits such as net water content (NWC) was maximum in *M. micrantha* and least in *L. aspera*. But, the highest value of leaf water per unit area (LWA) was observed in *M. micrantha* and lowest was exhibited in *R. dentatus* with increasing PM₁₀ pollution. Leaf dry matter content (LDMC) was maximum in *P. foetida* and least value was observed in *A. mexicana*. Leaf mass per unit area (LMA) was highest in *A. conyzoides* and lowest in *A. aspera*. One-way-ANOVA results recorded distinct variation in the responses of herbaceous plant species, grown under ambient PM₁₀ pollution. The study recommends *M. micrantha*, *P. foetida*, and *A. conyzoides* species for roadway greening and ecosystem conservation in Malda district and its similar type of climate.

Key words: Air pollution; PM₁₀; Vehicular emissions; SH-10; Dust Capturing Potential; Leaf function traits; Malda district.

INTRODUCTION

Air pollution has become a threat to urban and peri-urban population worldwide (Uka *et al.* 2017). In general, air pollutants can adversely affect human and plant health (Sarkar & Agrawal 2010, 2012) and global environment by changing the ambient air quality (Sarkar *et al.* 2012a,b; Rai 2013; Rai & Panda 2014). Air pollution emanating from PM with aerodynamic diameter less than 10µm i.e., PM₁₀ is very harmful, because it can penetrate deep into human lung to create cardiovascular diseases and enters through and/or block stomata in plants (Rai 2013). Vegetation is an effective indicator of the overall impact of air pollution particularly with respect to PM. In terrestrial plant species, the enormous foliar surface area acts as a natural sink