Investigation of Microbial Quality of Air During the Transboundary Haze in Kandy, Sri Lanka: December 2022 Update

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Sri Lanka experienced a transboundary haze event in December 2022. The air quality index changed significantly during this period. This study aims to determine the impact of haze events on bacterial consortia and the total microbial load (TML) of air collected during hazy and non-hazy days. Air sampling was done three times daily during the hazy days (9^{th}-16^{th} December 2022) at a place located 1.7 Km away from Kandy city. Control samples were collected during non-hazy days at the same location. A fine particulate air sampler with two different impactor systems consisting of sterile filter papers was used for sampling. Impactor A: collected fine particulate matter ≤ 2.5 microns; B: collected particulate matter in the $2.5 - 10$ microns range. After 30 minutes of sample collection, filter papers were cut into fine pieces and shaken in 8 mL sterile distilled water at 100 rpm for 2 hours. After centrifugation, the pellet was cultured on Luria-Bertani (LB) culture media. TML was determined using the flow cytometry technique. Ten different culturable bacterial species were identified. Among them, 48% were gram-positive bacilli. *Pseudomonas* spp. and *Bacillus* spp. were predominantly identified during the hazy days, while *Bacillus* spp. was predominantly reported on non-hazy days. TML was ~3.5-fold higher on hazy days (2.86×10^5 cells/m^3) than on non-hazy days (8.21×10^4 cells/m^3). The highest TML was obtained on the fourth day of the sample collection, and it was at its peak at noon, 6.67×10^5 cells/m^3 air. The microbial load was significantly higher in particulate matter deposited on the impactor system A than in B ($p < 0.001$). The findings suggest that pathogenic bacterial species with the highest microbial load were reported in a recent haze event. The bacteria could reach into the lower respiratory tract along with fine particulate matter (< 2.5 microns) causing lower respiratory distress.

Keywords: Air Pollution, Bacterial Diversity, Microbial Load, Transboundary Haze Event