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Study of chemical composition and microbial content of bulk depositions of selected sites in Gampaha district

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Wet atmospheric deposition, a natural primary scavenging process, removes organic and inorganic pollutants from the atmosphere. Significant variations in this process are observed depending on geographic conditions and anthropogenic factors. There is considerable research interest in the composition of atmospheric depositions, as it is important to decide the extent of atmospheric pollution and to predict the atmospheric quality of a selected area. However, in Sri Lanka, fewer previous studies have been reported on the chemical composition and microbial content of rainwater. In this study, three sites; Kerawalapitiya (Site A), University of Kelaniya (site B), and Keragala (Site C-control site), were selected from Gampaha district to investigate the chemical and microbial parameters of rainwater from November 2021 to March 2022. The bulk precipitation was analyzed for pH, conductivity, cations (Na^+ , Ca^{2+} , NH_4^+ , K^+ , Mg^{2+}), anions (NO_3^- , SO_4^{2-} , Cl^- , Br^- , F^-) using ion chromatography and trace metal elements (Mg, Al, Zn, As, Fe, Ni, Pb, Cu, Mn, Cr, Co, Cd) using Inductively coupled plasma-mass spectrophotometer. The pH range of all considered events was 5.98-7.31(± 0.4). Volume Weighted Average (VWA) conductivity was 120, 72 and 55, respectively in sites A, B, and C. The highest VWA conductivity was observed in Kerawalapitiya. Although there were differences in the order of ions, Na^+ and Ca^{2+} can be mentioned as the dominant cations in all the sites except in Keragala, where NH_4^+ was the dominant cation. Further, SO_4^{2-} , Cl^- , and NO_3^- can be mentioned as dominant anions in the selected sites. VWA of trace metal elements showed that the most abundant metal in all the sites was Mg, followed by Al and Zn. Co and Cr metal concentrations were comparatively the lowest in all three sites. The highest neutralization potential was associated with Na^+ , Ca^{2+} and NH_4^+ in sites A, B, and C, where the neutralization factors were 1.396, 0.655 and 0.310, respectively. Furthermore, the One-way ANOVA test revealed that there were significant differences in bacterial and fungal contents between all three sites ($p_{\text{bacteria}} = 0.000$, $p_{\text{fungi}} = 0.027$, $\alpha = 0.05$).

Keywords: Anions, Cations, Metals, Microorganisms, Rainwater.