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Atmospheric chemical composition of bulk precipitation of selected areas of Galle District.

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The quality of the atmosphere refers to its composition and the presence of pollutants, while precipitation can have direct effects on the quality of the atmosphere. Both wet and dry deposition contribute to the removal of pollutants and particles from the atmosphere. Therefore, it is very important to collect data on the chemical composition of the atmosphere to identify air pollution and its causes and to control air pollution. This study focuses on the chemical composition of precipitation in selected areas of Galle district, one of the most urbanized districts in the southern province. Wet precipitation samples were collected from three industrial sites, Unawatuna, Bataduwa, Koggala and the Sinharaja rainforest area of Lankagama, the country's last viable area of primary tropical rainforest. Wet precipitation samples were collected from September 2022 to February 2023, which covers the South-West monsoon, Second inter-monsoon, and North-East monsoon seasons and a total of 40 samples were analysed for pH, conductivity, Na^+, K^+, Mg^{2+}, Ca^{2+}, NH_4^+, Cl^-, F^-, Br^-, SO_4^{2-}, NO_3^-, Cu, Pb, Ni, Cd, Fe, Al, Zn, C, and Mn. Based on VWM (Volume Weighted Mean) pH values Unawatuna (6.95±0.6), Bataduwa (6.69±0.8) and Koggala (6.8±0.3) sites had slightly alkaline pH values, while the control site Lankagama-Sinharaja (5.73±0.02) had slightly acidic pH. The volume-weighted average concentrations of major ionic species in the precipitation samples from the industrial sites were in the order $Na^+ > Cl^- > SO_4^{2-} > Ca^{2+} > NO_3^- > NH_4^+ > K^+ > Mg^{2+} > Br^- > F^-$, while the control site followed the order of $Na^+ > Cl^- > SO_4^{2-} > Ca^{2+} > NH_4^+ > K^+ > NO_3^- > Mg^{2+} > F^- > Br^-$. The neutralization factor (NF) for Na^+ ions indicates that higher Na^+ concentrations contribute to the neutralization of acidic components at the Unawatuna, Koggala and Lankagama sites. When considering the marine contribution, The Enrichment Factors (EF) calculated for SO_4^{2-}/Na^+, Ca^{2+}/Na^+ and Mg^{2+}/Na^+ ratios were higher than the reference value, suggesting that several anthropogenic sources other than marine may be contributing. Among metallic constituents, Zn and Al concentration were higher at all sites except the Koggala site, which had higher Fe content. Pb and Ni concentrations were below the detection limit of ICP-MS at all sampling sites. This study confirmed the relationship between atmospheric chemical composition and nearby anthropogenic and natural sources, as well as the indirect relationship between rainwater analysis and air quality in a given region. Furthermore, the precipitation data from Sinharaja demonstrates the absence of pollution, further solidifying its reliability as a backdrop.

Keywords: Chemical composition, Wet precipitation, Tropical rainforest, Industrial sites