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Physicochemical and Bacteriological Quality Assessment of the Water Resources in the Mahafaly Plateau, Madagascar

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Abstract

The Mahafaly plateau in southwestern Madagascar is subjected to a semi-arid climate with low precipitation. This region is known for the water scarcity and poor water quality. The objective of this research was to determine the physicochemical and microbiological quality of the water points in the Tsimanampetsotsa National Park and in some villages located at the plateau and the coastal plain. Sixty wells, 6 caves, 5 sinkholes and 2 resurgences were sampled during the dry and wet season. For physicochemical parameters, pH, dissolved oxygen (DO), temperature, electric conductivity (EC), ammonia, phosphorus, nitrate, nitrite and iron were assessed. Indicator bacteria namely, total count, *Vibrio*, *Salmonella*, *Escherichia coli* and fecal coliforms were assessed for microbiological analysis. There was no significant difference in phosphorus ($p = 0.175$) and nitrite ($p = 0.245$) among the water sources. A significant difference in mean values of temperature, electric conductivity, alkalinity, DO, nitrate, ammonia and iron among location ($p < 0.05$) was noted. The coastal plain has the poorest water quality, almost all the chemicals values and bacteria counts were above the recommended limits. Water has high EC (7181±1091 μS/cm) and neutral pH (pH = 7.08±0.05). The mean concentration of *Escherichia coli*, *Salmonella* and *Vibrio* were 4500 CFU per 100 mL, 3400 CFU per 100 mL and 3800 CFU per 100 mL, respectively. Water sources in the park has moderate EC (2344.57±80.03 μS/cm) and slightly acidic pH (pH = 6.97±0.049). The average concentration of *Escherichia coli*, *Salmonella* sp and *Vibrio* sp was 500, 300 and 200 CFU per 100 mL, respectively. Sampled water sources on the plateau had low EC (664±73.27 μS/cm) and were slightly alkaline (pH = 7.39±0.048). Bacteria mean count were 400 CFU per 100 mL for *E. coli*, 2500 CFU per 100 mL for *Salmonella* sp. and 2500 CFU per 100 mL for *Vibrio* sp. Water quality depended on the water sources type, the season and the local uses. Poor sanitary condition constitutes one of the principal causes of the water contamination.

Keywords: Bacteria, Madagascar, Mahafaly Plateau, sub-arid climate, water quality

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