ABSTRACT

Coastal industrial areas are increasingly recognized as significant sources of heavy metal input into marine environments, with fertilizer manufacturing facilities identified as a notable contributor due to impurities present in raw materials used during production. PT Pupuk Iskandar Muda (PT PIM), a fertilizer industry located in the coastal area of North Aceh, operates a port basin that receives liquid waste discharge from urea, ammonia, and NPK production units, raising concerns over potential lead (Pb) and copper (Cu) contamination in the surrounding seawater. This study aimed to analyze Pb and Cu concentrations in seawater and to assess water quality based on physical-chemical parameters at the port basin of PT PIM. Water samples were collected from three stations using purposive sampling and analyzed using Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES), while temperature, pH, salinity, and dissolved oxygen (DO) were measured in situ. The results showed that Pb concentrations averaged 0.001 ppm at station 1, <0.001 ppm at station 2, and averaged 0.008 ppm at station 3, while Cu concentrations were <0.001 ppm at all stations, both remaining far below the 0.05 ppm quality standard established by Kepmen LH No. 51 of 2004. Water quality measurements showed pH (8.18–8.46) and DO (7.67–8.13 mg/l) values within the standard, while temperature (30.3–30.4°C) and salinity (29.67–30.67‰) slightly exceeded the reference thresholds. These findings indicate that the port basin of PT PIM has not been contaminated by Pb and Cu and remains safe for the marine biota inhabiting the area, although continued monitoring is warranted given the recent expansion of NPK fertilizer production at the facility.

Keyword: Cu, heavy metal, ICP-OES, Pb, port basin, PT Pupuk Iskandar Muda, water quality