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Rapid industrialization and urbanization processes has led to the incorporation of different heavy metals in natural resources like soil, water and air thus affecting their quality. Aluminum (Al) is a dominant heavy metal pollutant that causes serious toxic effects to living systems including plants. Therefore, it is critical to regularly monitor the changes in Al levels in natural resources. Living organisms could be used as bioindicators for monitoring and measuring the levels of heavy metals in environmental samples. The aim of this study was to develop a cost effective bioindicator for monitoring aluminum (Al) and assess the damage caused by Al bioaccumulation using the root system of Calotropis Procera seedlings. A hydroponic system was developed for growing C. Procera in four different concentrations of Al (20, 40, 60 and 80 ppm). Root length and shoot fresh and dry weights were assessed after 5, 10, 15 and 20 days of Al treatment. The results showed remarkable sensitivity of C. Procera seedlings for the different concentrations of Al. There was gradual but significant decrease in C. Procera root length with the increase in the Al concentrations. X-ray fluorescence microscopy (XRF) analysis indicated a significant increase in Al concentration in C. Procera roots with the increase of both Al concentration in the hydroponic solution and the growing period. Moreover, electrical conductivity analysis showed that Al induced damage to C. Procera root plasma membrane as indicated by the increase in electrolyte leakages. Randomly amplified polymorphic DNA (RAPD) PCR analysis confirmed the genotoxin effect of Al which induced C. Procera genomic DNA modification. Altogether, the result demonstrated that C. Procera could be used as a bioindicator for direct monitoring of aluminum environmental pollution.