

Impact of Industrial Pollution on Photosynthetic Pigments, Heavy Metal Accumulation, and Organic Matter in Plants

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Abstract: Industrial pollution severely affects plant physiology, biochemical integrity, and structural stability. This research investigates the effects of industrial emissions on chlorophyll content, heavy metal accumulation, and organic composition in plants located in the MIDC area of Roha, Raigad. A comparative analysis between plants from polluted industrial zones and non-polluted control areas was conducted to evaluate environmental stress due to industrialization. The study focuses on three ecologically and economically significant plant species—Areca catechu (Areca palm), Cocos nucifera (Coconut), and Manilkara zapota (Sapodilla). Chlorophyll content, a key indicator of photosynthetic capacity, was assessed using Arnon's spectrophotometric method. Heavy metal levels, including chromium (Cr), iron (Fe), copper (Cu), and cadmium (Cd), were determined via Atomic Absorption Spectrophotometry (AAS) following tri-acid digestion. Organic matter composition was examined to assess biochemical changes due to pollutant exposure. Results revealed a significant decline in chlorophyll levels, an increased accumulation of heavy metals, and notable variations in CHNS composition in plants from polluted environments. The correlation between pollution levels and plant health indicators emphasizes the role of plants as bioindicators of environmental contamination. This study underscores the need for routine pollution monitoring, effective pollution control strategies, and biodiversity conservation in industrial regions. The findings provide essential insights for environmental policymakers and contribute to sustainable ecological restoration initiatives.

Keywords: Industrial pollution, chlorophyll content, heavy metal accumulation, bioindicators, environmental monitoring, plant health, pollution control, ecological restoration

