Tite of the talk:

Sustainable Air Quality Management Using Algae-Based Biosystems

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Brief Abstract:

Air pollution poses a major environmental and public health challenge in India due to rapid urbanization, industrialization, vehicular emissions, biomass burning, and poor waste management. Prolonged exposure to polluted air leads to severe respiratory and cardiovascular diseases, reduced life expectancy, and adverse impacts on food security. Despite regulatory efforts, air quality in many urban centres remains critically poor, while existing monitoring and purification technologies are often costly, energy-intensive, and unsustainable. Microalgae present a promising eco-friendly alternative owing to their high photosynthetic efficiency and ability to assimilate carbon dioxide and other toxic air pollutants. As sunlight-driven systems, microalgae simultaneously sequester greenhouse gases and release oxygen, making them suitable for sustainable air purification. Freshwater microalgae exhibit rapid growth, environmental adaptability, and resilience, enabling their application in both indoor and outdoor settings. This study proposes the development of a cost-effective algae-based air quality monitoring and purification system capable of reducing major air pollutants, including gaseous contaminants and particulate matter, to meet safety standards. The system also enables environmental forensic applications by correlating pollutant profiles with microalgal responses, supporting pollution source identification and regulatory enforcement. Overall, the proposed biosystem integrates sustainable biotechnology with environmental forensics to improve air quality, protect public health, and promote long-term environmental sustainability.

Keywords: Microalgae-based air purification; Sustainable air quality monitoring; Environmental forensics; Pollution mitigation; Green biotechnology.