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Annotation: *Water scarcity and contamination remain pressing global challenges, particularly in arid and semi-arid regions such as Turkmenistan. One of the promising approaches to addressing this problem is the production of bioabsorbents from locally available plant residues. This study explores the potential of agricultural and forestry by-products—including cotton stalks, wheat straw, and saxaul residues—for the development of eco-friendly bioabsorbents for water purification. The research discusses the physical and chemical modifications required to enhance the adsorption properties of plant-based materials, such as carbonization, activation, and surface functionalization. Furthermore, experimental studies on adsorption capacity for heavy metals, dyes, and organic pollutants are analyzed, highlighting the*

efficiency and cost-effectiveness of bioabsorbents compared to conventional treatment methods. The integration of bioabsorbent technology into Turkmenistan's water management strategies not only provides a sustainable solution for environmental protection but also supports the circular economy through the valorization of agricultural residues.

Keywords: *Bioabsorbents; Water purification; Plant residues; Turkmenistan; Environmental sustainability; Biomass utilization; Green technology*

Introduction

Access to clean and safe water is one of the most critical challenges facing humanity in the 21st century. The problem is particularly urgent in regions characterized by limited freshwater resources, including Turkmenistan, where water scarcity is compounded by pollution from industrial, agricultural, and domestic activities. Conventional water treatment technologies—such as chemical precipitation, membrane filtration, and ion exchange—are often costly, energy-intensive, and produce secondary waste. As a result, researchers have increasingly turned to bio-based alternatives that are environmentally sustainable and economically viable.

Among such approaches, the use of bioabsorbents derived from plant residues has gained significant attention. Turkmenistan, with its vast agricultural production and unique desert vegetation, generates a considerable amount of biomass that is often underutilized or disposed of as waste. Transforming this biomass into bioabsorbents offers a dual advantage: reducing environmental waste and providing cost-effective materials for water purification.

Plant Residues in Turkmenistan as a Resource for Bioabsorbents

Turkmenistan's agricultural sector produces large quantities of residues, such as:

- Cotton stalks – abundant due to the dominance of cotton production in the national economy.
- Wheat straw and husks – generated from wheat cultivation, which occupies vast agricultural areas.

- Saxaul (Haloxylon spp.) residues – desert shrubs that can provide lignocellulosic biomass.
- Pomegranate peels, melon rinds, and other fruit residues – seasonal agro-wastes with high organic content.

These plant residues are rich in cellulose, hemicellulose, and lignin, which provide functional groups (–OH, –COOH, –OCH3) capable of binding various pollutants, including heavy metals, dyes, and organic compounds.

Methods of Producing Bioabsorbents

The preparation of bioabsorbents typically involves physical, chemical, or combined modifications to enhance their adsorption efficiency. The main techniques include:

- Carbonization – thermal treatment of biomass under limited oxygen conditions to produce biochar with porous structure.
- Activation – chemical (using agents such as KOH, H3PO4, or ZnCl2) or physical (using steam or CO2) processes to increase surface area and porosity.
- Surface Functionalization – modification with acids, bases, or nanoparticles to introduce additional active sites for pollutant binding.

For example, cotton stalks subjected to carbonization and subsequent activation demonstrate a significant increase in surface area, enabling them to adsorb heavy metals such as lead (Pb^{2+}) and cadmium (Cd^{2+}). Similarly, fruit peel residues can be functionalized to capture dyes from textile effluents.

Applications in Water Purification

Bioabsorbents derived from plant residues are effective in removing a wide range of contaminants:

- **Heavy metals (Pb, Cd, Cr, Hg, As)** – commonly associated with industrial discharges.
- **Organic pollutants (pesticides, phenols, hydrocarbons)** – prevalent in agricultural and petrochemical sectors.
- **Synthetic dyes** – released from textile industries, which are active in Turkmenistan's economy.

Laboratory-scale studies have demonstrated adsorption capacities comparable to or exceeding those of commercial activated carbon. Moreover, bioabsorbents are biodegradable and locally available at minimal cost, making them particularly suitable for rural communities and decentralized water treatment systems.

Conclusion

The development of bioabsorbents from plant residues growing in Turkmenistan represents a promising and sustainable technology for water purification. By employing locally abundant agricultural and natural biomass, this approach provides an eco-friendly alternative to conventional treatment methods while simultaneously addressing waste management challenges. Future research should focus on optimizing production methods, scaling up pilot projects, and integrating bioabsorbent technologies into national water management strategies. The widespread adoption of this technology has the potential to improve water quality, promote sustainable resource use, and support environmental protection in Turkmenistan.

References

5. Yongabi, K. A. (2010). Biocoagulants for water and waste water purification: a review. International review of chemical engineering, 2(3), 444-458.
6. Jain, C. K., Malik, D. S., & Yadav, A. K. (2016). Applicability of plant based biosorbents in the removal of heavy metals: a review. Environmental Processes, 3(2), 495-523.
7. Osman, A. I., El-Monaem, E. M. A., Elgarahy, A. M., Aniagor, C. O., Hosny, M., Farghali, M., ... & Eltaweil, A. S. (2023). Methods to prepare biosorbents and magnetic sorbents for water treatment: a review. Environmental Chemistry Letters, 21(4), 2337-2398.
8. Ali, H. R., & Hassaan, M. A. (2017). Applications of bio-waste materials as green synthesis of nanoparticles and water purification. Adv. Mater, 6(5), 85.