

Statistical Analysis of Degradation of Dye by Using *Moringa* Nanoparticles

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ABSTRACT

In this research, nanoparticles are prepared through green synthesis using *Moringa oleifera* leave extract as precursor. Removal of dye is studied by synthesized nano-adsorbent to overcome the environmental hazardous. Statistics is employed to data analyses obtained from dye experiment. Regression and variance analysis is done by Minitab software. Statistical tools are widely used to analyze nanoparticles' properties, including size, shape, distribution, and surface characteristics.

Keywords: Green Synthesis, Nanoparticles, Eco-Friendly, Minitab, Adsorption.

INTRODUCTION

Now a days many types of nanoparticles are prepared through green chemistry, such as with metal, polymeric and metal oxide materials. Nanoparticles offer many exceptional properties as compare to the macroscopic materials. They used in targeted drug delivery system and imaging techniques. Utilization of these materials in electronic devices enhances the performance and miniaturization. (Lal *et al.* 2024). They also used to resolve environmental pollution, remediation and monitoring. The safety of environment has been increased as the increasing utilization of nanoparticles. Research continues to advance, focusing on synthesis methods: Developing greener and more efficient production techniques. Tailoring nanoparticles for specific applications through surface modification. Combining insights from materials science, biology, and engineering to pioneer new applications. Many oxide nanoparticles are synthesized and it is easy to make with different methods or precursor. Green synthesis is trending in nano chemistry. Due to its ecofriendly synthesis, it is used to overcome the water pollution and employ for wastewater treatment by adsorption process. (Eleryan *et al.* 2023) Further, statistical tool is used for the study of the nanoparticle. The descriptive and inferential analysis is done by software. Minitab software is provided descriptive stats, regression analysis, and Anova analysis and makinggraphs. Statistics software gives complete picture of the analysis. Statistics software is eased the complex software (Jalu *et al.* 2021).

OBJECTIVE

- Prévention of wastage, and use of economically good and less hazardous substances.through green chemistry.
- Utilization of nanoparticles for removal of dyes and metals to overcome the water pollution.
- To study the advantages of nano scale size of the particles.
- To identify the trend and pattern of raw data by statistics software.

METHODOLOGY

Firstly, synthesized nanoparticles through *Moringa oleifera* leaves. Thenemploys the adsorption methods for the removal the dyes and pollutants (Adam *et al.* 2021). Adsorbate Concentration, amount dose, agitation time at room temperature were studied. FTIR spectra and UV spectroscopy used for the characterization of particles. In this research, metal oxide nanoparticles are prepared with green synthesis and wastage materials. minitab software was used for statistical analysis of the relevant data.

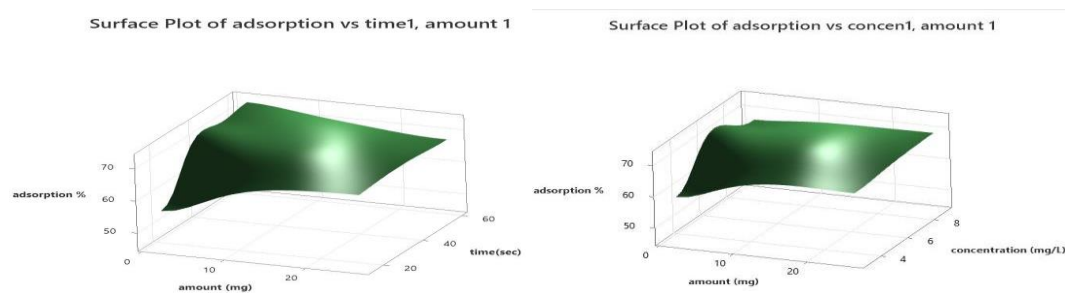
RESULT

The adsorption of dye by using synthesized nanoparticles shows 80 %removal. By applying statistical analysis p—value (0.0121) and f-value (3.87) were obtained.

CONCLUSION

In current research, nanoparticles shows good adsorption properties for the removal of dyes. Nanoparticles capable of simultaneous adsorption and degradation of pollutants in wastewater. These nanoparticles could incorporate catalytic functionalities to facilitate pollutant degradation alongside adsorption, leading to more efficient and comprehensive wastewater treatment processes. Also the statistical tools give complete picture of the good analysis and optimization factor.

Graphs



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