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Abstract

Evaluation of the Catalytic Degradation Capacity of Green Synthesized Silver Nanoparticles on Bis-Azoic Dyes †

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Introduction: Silver nanoparticles (AgNPs), widely recognized for their antimicrobial and antioxidant capacity, can be prepared following both conventional and unconventional routes and have a multitude of applications in numerous scientific domains, including the catalytic degradation of dyes that result from the textile industry [1,2]. The present research paper describes the one-pot eco-friendly synthesis of silver nanoparticles from different plants (Celandine, Magnolia, Red deadnettle, Dwarf everlast, etc.) and their potential application in the catalytic degradation of bis-azoic dyes (Direct Orange 26, Direct Brown 2 and Direct Black 38). **Materials and methods**: Aqueous extracts, prepared using the above-mentioned plants at room temperature for 24 h, were further used for the green synthesis of AgNPs at room temperature, at 30 °C and at 50 °C. In order to confirm the formation of the AgNPs, UV-Vis, FTIR, DLS and SEM spectra were recorded. The antioxidant activity of the green synthesized AgNPs was determined using the DPPH method, and their potential use for the degradation of bis-azoic dyes was investigated. **Results:** The formation of eco-friendly AgNPs was monitored by recording UV-Vis spectra at different time intervals, and revealed peaks at 438 nm (AgNPs-Celandine), 442 nm (AgNPs-Magnolia), and 450 nm (AgNPs-Red deadnettle). FTIR determinations revealed the major functional groups present in the structure of the AgNPs (e.g., C=C, C=O, C-H, etc.). The catalytic degradation of the bis-azoic dyes showed that the highest decrease in the maximum absorption intensity was observed in the case of Celandine–AgNPs (Table 1). **Conclusions**: This paper describes the green synthesis of AgNPs from different plants and their physical–chemical characterization using UV-Vis, FTIR, DLS and SEM. Moreover, the preliminary studies carried out to investigate their potential use in the degradation of some azoic dyes revealed that, in the studied reductive degradation, the highest values for ΔA were found for Direct Brown 2.

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Table 1. Catalytic degradation of Direct Orange 26 by green synthesized silver nanoparticles.

Sample	Reaction Time				
	0 min	**15 min**	**30 min**	**1 h**	**ΔA**
DO 26 (sol 50 mg/L)	1.786	-	-	-	-
DO + AgNPs-Celandine	1.496	1.456	1.440	1.411	22.34
DO + AgNPs-Magnolia	1.500	1.458	1.392	1.347	28.33
DO + AgNPs-Red deadnettle	1.697	1.674	1.670	1.658	8.79
DO + AgNPs-Celandine+reductive agent (RA)	1.151	1.212	1.170	1.125	43.35
DO + AgNPs-Magnolia + RA	1.187	1.188	1.124	1.072	46.02
DO + AgNPs-Red deadnettle + RA	1.297	1.291	1.208	1.146	45.02

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