

MICROWAVE- AND ULTRASOUND-ASSISTED EXTRACTION TECHNIQUES FOR THE RESEDA LUTEOLA L. DYE: OPTIMIZATION, CHARACTERIZATION, COLORIMETRY AND UV PROTECTION.

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Abstract:

The growing interest in replacing synthetic colorants with natural alternatives stems from a growing concern for the environment, with natural colorants generally perceived as less harmful and more environmentally friendly due to their greater biodegradability [1]. The present study focuses on exploring the aerial parts of *Reseda Luteola L.* as a potential source of natural yellow dye for wool dyeing. Microwave- and ultrasound-assisted extraction methods were used to extract the dyes, compared to the traditional reflux heating method. Extraction process parameters, such as time and solvent composition, were optimized to maximize dye yields from *Reseda Luteola L.* [2].

Analytical methods such as UHPLC-PDA, FTIR, XRD, UV-VIS, SEM-EDX, DSC, ¹H NMR and TGA are applied to characterize the compounds present in the extracted dye, combining analyses of composition, molecular structure and thermal properties.

Dyeing was carried out using an alum-based mordant to prepare the wool, which was then dyed with the optimized dye extract. Each dyed material was then characterized by FTIR to analyze its chemical composition and functional properties. The color of each dyed material was also evaluated in terms of CIELAB values (L*, a* and b*) and color intensity value (K/S) to fully understand the chromatic variations induced by the dyeing process. The fabrics were assessed for their ability to protect against harmful UV rays and their antibacterial properties.

Keywords: natural colorant, *Reseda Luteola L.*, extraction, ultrasound, microwave.



Figure 1: *Reseda Luteola L.*

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