

Sustainable Dyeing of Wool with Agricultural Waste as Natural Dyes

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Keywords: Agricultural wastes, natural dyes, waste valorisation, wool.

Natural dyes have been used for centuries as a source of color for textile and fabrics (Kasiri & Safapour, 2014). Unlike synthetic dyes, natural colorants are derived from plants, animals, and mineral sources, and they do not contain harmful chemicals that are damaging to the environment or to human health (Shahid et al., 2013). In recent years, there has been a renewed interest in using natural dyes due to concerns about the environmental impact of synthetic colorants and the desire for sustainable and eco-friendly textiles (Yusuf, 2019). Furthermore, natural dyes provide a variety of unique and vibrant colors and shades, as well as the added benefit of being biodegradable, non-toxic, and having antimicrobial and UV protective properties (Mohd et al., 2017). However, there are challenges associated with using natural dyes, including their limited color range, lower dyeing efficiency, and lack of standardization. Additionally, natural dyes are often more expensive than synthetic dyes, making them less accessible for industrial applications. The high cost of natural colorants is due to several factors, including the limited availability of raw materials, the high labor costs of extraction and processing, and, importantly, the lack of standardized production methods.

Therefore, it is necessary to explore alternative sources of natural dyes, such as agricultural waste, to overcome these challenges. Agricultural waste contains a significant amount of dye-yielding compounds, which can be extracted and used for dyeing textiles (Jose et al., 2019). This approach not only reduces the environmental impact of textile production but also provides an economic opportunity for farmers and promotes sustainable agriculture.

Our research study focused on exploring the possibility of extracting natural dyes from agricultural waste products such as pomegranate rinds and walnut shells. Ultrasound activation was employed as an efficient and novel extraction method. To identify and analyse the color components extracted from the plant materials, we utilized FTIR, UV, and HPLC-DAD techniques. The extracted natural dyes were then used to dye wool fiber, and various assays such as colorimetric, exhaustion, and fixation studies were carried out.



Figure 1. natural dyeing of wool by agricultural waste extracts.

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