

Biosorption of a cationic dye using raw and functionalized *Chenopodium quinoa* pericarp biomass after saponin glycosides extraction, a sustainable approach to a green, zero waste-management.

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Abstract

The bio-waste of *Chenopodium quinoa* pericarp (QBW) is an important source of biopolymers and glycosides with many post-functionalization possibilities for various applications. In this study, QBW-based biosorbents, after saponin glycosides extraction, were successfully prepared by chemical and thermal treatments. We observed that QBW is constituted by 40% of cellulose, 15% of hemicellulose and 10% of lignin. In this framework, lignocellulosic biosorbents obtained from these under-utilized wastes have been studied in the evaluation of biosorption performance of methylene blue (MB) as a model contaminant (**Fig- 1**). Furthermore, the effect of various parameters on MB removal efficiency was studied, including contact time, adsorbent quantity, initial concentration, and process temperature. To get further insight into the adsorbents behavior and to propose a suitable biosorption mechanism, the QBW were deeply analyzed by different techniques, including FTIR, TGA, Zeta Potential, SEM/EDX, and contact angle. Among the three developed bio-sorbents, the chemically treated bio-adsorbent (QBW-II) demonstrated the highest MB removal efficiency in biosorption tests. According to the biosorption results, we observed fast adsorption kinetics that did not exceed 60 min, with an adsorption efficiency up to 80-90%, and a maximum adsorption capacity of $193.802 \pm 48.365 \text{ mg.g}^{-1}$. Therefore, QBW has high potential to be used as an environmentally friendly and promising bio-sorbent for the effective remediation of organic contaminants from aqueous systems.

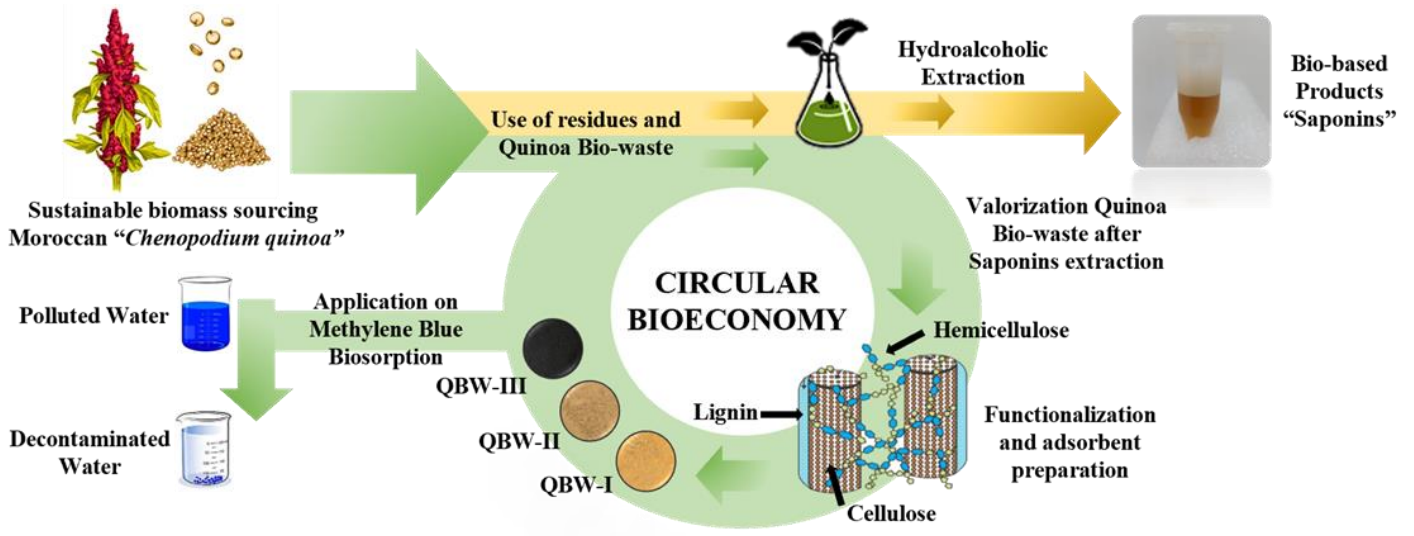


Figure-1: Valorization loop of Quinoa waste biosorbents after saponin glycosides extraction