



**Performance Assessment of Chitosan- Coated Bamboo Fiber Filters
Integrated with Bamboo-Based Biochar for Waterborne Bacteria Removal.**

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Abstract

Water pollution caused by *Escherichia coli* (*E. coli*) is a major public health concern, while conventional water treatment methods are often expensive and may leave chemical residues. This project developed an eco-friendly bio-based water filtration membrane by coating bamboo fibers with a chitosan–bamboo biochar composite to improve bacterial removal. The approach also supports the circular economy by converting agricultural waste into value-added materials. A biochar suspension was prepared in a chitosan solution dissolved in acetic acid. Bamboo fiber sheets were coated using the dip-coating method and dried at 60°C to form a stable filtration layer. Filtration performance was evaluated using water samples contaminated with *E. coli* at an initial concentration of 10⁸ CFU/mL. The experiment was conducted in triplicate. The coated bamboo fiber filter achieved a 95.8% reduction in bacterial contamination, significantly outperforming uncoated bamboo fiber filters. This performance resulted from the combined effects of physical trapping by the porous structure of bamboo fibers and biochar and the antimicrobial activity of positively charged chitosan, which disrupts bacterial cell walls. These findings demonstrate the potential of the developed composite filter as a low-cost, efficient, and environmentally friendly solution for reducing bacterial contamination in water.

Keywords: Bamboo fiber filter, Chitotan, Biochar, Waterbome bacteria