A Low Cost and High Performance Xylem-Activated Carbon Filter Water Purification Device: A Novel Approach to the Global Clean Water Crises

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Globally, over 2 billion people lack access to safe drinking water leading to 3.4 million waterborne deaths yearly. Existing purification methods are often ineffective against both biological and chemical contaminants, or simply too expensive for low-income communities. This research designed an affordable, efficient, and sustainable water filtration device for household use in regions struggling with access to clean water. The device was engineered from a novel xylem-activated carbon filter made by leveraging readily available materials. Orange peels were used to bioengineer a broad-spectrum antimicrobial coating for the xylem filter, while activated carbon was combined with illite from clay soil to create a powerful filter media that has the ability to remove a wide range of chemical and biological contaminants. From laboratory tests, the xylem-activated carbon filter exhibited an exceptional performance removing over 99% of the contaminants tested. Additionally, it had a flow rate of exceeding 1.7L/h, thus, providing over 40 L of clean water daily, easily meeting a family's needs. Inspired by the device's high performance, community workshops were conducted, teaching people how to build these devices, to enable household water purification to be accessible. Over 120 households previously dependent on municipal contaminated water are now using the device, experiencing a drastic improvement in their water quality. This sustainable, low-cost and reliable water filtration device offers a powerful solution to the global clean water crisis and has the potential to enable more than one billion people to have access to water filtration and this could significantly reduce water-borne disease deaths by two million.

Awards Won:
Second Award of $2,000
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