

## Removal of pollutants from water using novel adsorbents

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### Abstract

Water pollution by various pollutants: organic dyes, heavy metals and emerging contaminants, is a serious issue in Sri Lanka, seeking attention from research scientists in order to develop cost-effective strategies for the efficient removal. Hence, novel strategies, related to the adsorption science, were tested at the Department of Agricultural Engineering, Faculty of Agriculture, University of Jaffna, for the proficient removal of pollutants from water. Accordingly, the biochar, derived from neem (*Azadirachta indica*) chips, has been used successfully for the removal of an emerging contaminant called 'mancozeb' from water. Furthermore, engineered biochar derived from the neem chips, using iron catalyst, has productively been used for the removal of an organic dye called 'methylene blue'. In addition, the use of biosorbents for the removal of different organic pollutants has successfully been tested.

Moreover, rigorous testing methods: isotherm analysis, kinetic analysis, X-ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), rate-limiting factor determination and adsorption thermodynamics, have effectively been used to understand the adsorption mechanism of different, harmful pollutants, present in water, using novel adsorbents, which can be developed at the commercial level.

The findings of the research works indicated that the biosorbent called 'sprout casing of palmyrah (*Borassus flabellifer*)' had expressed the adsorption capacity of  $27.67 \pm (0.05)$  mg/g to methylene blue. Moreover, the neem chip biochar, pyrolysed at 900°C, exhibited the better adsorptive performance (187.68 mg/g) to an emerging contaminant called 'mancozeb'. Besides, engineered biochar, derived from neem chips, using iron catalyst showed the adsorptive performance of 63.39 mg/g. These findings have been published in indexed journals. Furthermore, many scientific investigations are being done at the Environmental Research Laboratory of the Department of Agricultural Engineering, University of Jaffna in order to develop novel, effective adsorbents for commercial applications.

**Keywords:** Water pollution, Adsorption, Engineered biochar, Biosorbents.

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