Coconut coir: not just a beautiful doormat

Coconut is one of the most versatile fruits with amazing medicinal properties and astonishing health benefits. Even the coconut coir is extensively used for making doormats, decorative items and in upholstery industry. No wonder coconut palm is called the 'tree of life'. More recently, remarkable applications of coconut coir and coir dust in diverse fields are emerging.

Coir dust and biochar obtained from coconut fibre serve as a good peat substitute[1,2]. Biochar, a carbon-rich material that is porous with oxygen functional groups and aromatic surfaces is obtained from thermal degradation of organic materials such as crop residue, forest residue, wood, manure and other materials. Moreover, biochar locks up rapidly decomposing carbon in plant biomass in soils for hundreds or thousands of years. It improves the structure and fertility of soils, thereby improving biomass production. It not only enhances the retention and thus efficiency of fertilizers but also decreases fertilizer run-off[3]. Besides, coir pith has been found to harbour useful microorganisms with potential use as plant nutrient, including nitrogen-fixing bacteria[4].

A wide variety of heavy metals and organic chemicals originating from industrial effluents are potentially toxic, owing to their detrimental effects to humans and other living organisms. One of the promising remedies for their removal is using coconut coir pith, especially in the form of biochar for adsorption technology. In spite of proven efficacy of activated carbon as an adsorbent for metal removal, its high cost has restricted its pervasive use. Due to high surface-to-volume ratio and substances inherently associated with cellulose such as lignin, tannin and pectin, which contain polyphenolic and aliphatic hydroxyl and carboxylic groups, biochar can be a potential sorbent for heavy metals as well as organic pollutants, particularly planar aromatic compounds. Lignocellulosic biomass obtained from coconut is an attractive precursor for biochar preparation, as it shows high porosity. Coir-based biochars manifest as cost-effective scavengers for chromium (VI), mercury (II), etc.[5,6]. On the other hand, different chemical activating agents can be used for improving the adsorption properties of these carbons and they include KOH, $ZnCl_2$, H_2SO_4, H_3PO_4 and HNO_3.

In the construction sector, eco-efficient materials obtained from coconut coir can innovatively substitute some traditional construction materials like particleboards having applications as insulating ceiling and walls. Consequently, wax can be added to composite boards to increase the resistance to absorption of liquid water. In order to improve physical and mechanical properties of these panels, adhesives like castor oil-based polyurethane, urea formaldehyde, phenol formaldehyde and isocyanate can be used. Using such panels with low thermal conductivity will decrease the energy consumption of building facilities (air-condition), since they reduce heat transfer into space[7,8]. Also, coir dust extract acts as a good corrosion inhibitor for acid-induced corrosion of aluminium via adsorption of the extract components on the metal surface through the functional groups present on the extract. Its inhibition efficiency increases with increase in extract concentration and with temperature[9].

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