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Preliminary Physiochemical Analysis of Herbal Solid Waste Generated from Selected Ayurvedic *Kwatha* Manufacturing Process

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Abstract

Herbal solid waste generated from Ayurvedic industry is abundant and sharp. Dumping them in landfill sites or open spaces near industrial sites raises various environmental concerns. This study is aimed at investigating the potential of herbal solid waste generated from the Ayurvedic industry to be utilized in waste valorization in order to promote sustainability and innovation in resource management. Therefore, the chemical and physical properties of herbal solid waste (residues) discarded from four selected Ayurvedic *Kwatha* (decoctions) manufacturing processes were analyzed. Residues from Thripala *Kwatha*, Medhaharani *Kwatha*, Daruparpata *Kwatha*, and Patolakatukabiru *Kwatha* have been selected since these are frequently used in primary healthcare. The moisture contents of the residues ranged from 8±1% to 13±1%. The ash contents of the residues ranged from 3.0±0.2% to 6.2±0.3%. In this study, the highest antioxidant activity was obtained in Thripala *Kwatha* (IC_{50} 101.76±0.02 μg/mL) residue in the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. The methanolic extract of Thripala *Kwatha* residue exhibited the highest total phenolic content (13.81±0.07 mg GAE/g) of all the methanolic extracts of the residues evaluated. The mineral content of the *Kwatha* residues were also evaluated using flame atomic absorption spectroscopy. The Ca content of the residues ranged between 0.74% to 3.60%. The Mg content of the residues ranged between 0.12% to 0.35%. The highest Pb (3.8 μg/g), Zn (58.4 μg/g), and Mn (153.4 μg/g) content was obtained in the Medhaharani *Kwatha* residue. The highest Fe (909.8 μg/g), and Cu (8.3 μg/g) content was obtained in Daruparpata *Kwatha* residue. The highest condensed tannin content was detected in Thripala *Kwatha* (0.064±0.004 mg CE/g) residue in vanillin-HCl assay. In the disc diffusion assay, the methanolic extract of Thripala *Kwatha* residue inhibited the growth of *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli*, and *Pseudomonas aeruginosa* at 0.04 mg/mL concentration indicating the highest antibacterial property among all the *Kwatha* residues analyzed. This study suggests that this herbal solid waste has the potential for further research and development, as well as a number of industrial applications, including those in the pharmaceutical, cosmeceutical, nutraceutical, and agricultural industries, since these residues contain significant bioactive components.

Keywords: *Kwatha residues, Waste valorization, Antioxidant activity, Antibacterial activity, Mineral content*