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Beneficiation of eucalyptus tree barks in the context of an integrated biorefinery – Optimisation of accelerated solvent extraction (ASE) of polyphenolic compounds using response surface methodology

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Abstract

Bark from trees obtained from sustainably managed plantations used in the production of timber, pulp and paper is an under-utilised waste in many countries across the world. However, in the context of an integrated biorefinery, they may serve as a valuable feedstock for the production of high-value products for increased revenue generation and mitigation of environmental impacts for the ailing forestry, timber, pulp and paper industry. In this study, optimum accelerated solvent extraction conditions were established for the recovery of total polyphenolic compounds (TPC) and total extractive content (TEC) from barks obtained from four Eucalyptus tree species (E.dunnii, E.grandis, E.smithii and E.nitens). Using a response surface methodology and Box-Behnken experimental design, optimum extraction conditions found were an extraction temperature of 117 °C, three extraction cycles, and a milled bark particle size class of 500–850 μm. E. smithii showed the highest TEC at 21.9% and the highest TPC at 4.7 g/100 g gallic acid equivalents (GAE).