Isolation of Anacardic Acid from Natural Cashew Nut Shell Liquid (CNSL) Using Supercritical Carbon Dioxide

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Abstract

Solvent extracted cashew nut shell liquid (CNSL), conventionally known as natural CNSL, is a mixture of several alkenyl phenols. One of these alkenyl phenols is anacardic acid, which is present at the highest concentration. In view of anticipated industrial applications of anacardic acid, the objective of this work was to isolate anacardic acid from natural CNSL by supercritical carbon dioxide (scCO2). In this study, the solubility data for natural CNSL in scCO2 under a range of operating conditions of pressure (100, 200, and 300 bar), temperature (40 and 50 °C), and CO2 flow rate (5, 10, and 15 g min−1) were established. The best scCO2 working conditions were found to be 50 °C and 300 bar at a flow rate of 5 g min−1 CO2. Using 3 g of sample (CNSL/solid adsorbent = 1/2) under these scCO2 conditions, it was possible to quantitatively isolate high purity anacardic acid from crude natural CNSL (82% of total anacardic acid) within 150 min. The anacardic acid isolated by scCO2 was analyzed by different spectroscopic techniques (UV−vis, FT-IR, and 1H NMR) and HPLC analysis, indicating that the anacardic acid isolated by scCO2 has better quality than that obtained through a conventional method involving several chemical conversion steps.

Keywords:

Anacardic acid;
Cashew nut shell liquid;
FT-IR;
HPLC;
NMR;
Supercritical CO2