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Fractionation of Valuable Chemicals from Industrial Waste of Turmeric Rhizomes †

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Abstract: In the present study, turmeric oil rich in phenolic compounds and a fraction of curcuminoids were extracted from the Industrial Turmeric Waste (ITW) generated from the curcumin-producing industry. Hydrodistillation has yielded the best recovery of turmeric oil from industrial turmeric waste. Using the Taguchi method for process optimization, four factors at three levels have been optimized. Solid loading (15 g), water volume (250 mL), percentage of the power of heating mantle (90 %), and time of extraction (120 min) were the optimum levels under which 24.4 % (w/w) turmeric oil has been recovered. Turmerone (18.38 %), aR-turmerone (29.71 %), and curlone (20.04 %) were the main compounds present in the oil as per analysis using GC-MS. Curcuminoids present in the residue left after extraction of oil have been identified and purified by anti-solvent crystallization. Three factors having three levels of each were selected for optimization using the Taguchi method. Solvent to the anti-solvent ratio (1:10), crystallization time (30 min), and temperature (27.5 ºC) have been obtained as the optimized conditions under which 90.20 % crystallization yield was obtained. Upon crystallization, the curcuminoid's purity was also improved. Thus, with a simple approach, it was possible to valorize the waste generated from the industry.

Keywords: turmeric rhizomes; essential oils; curcuminoids; hydrodistillation; extraction; Taguchi; anti-solvent crystallization.

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Conflicts of Interest

The authors declare no conflict of interest.