

DESIGN OF A PROCESS FOR THE PRODUCTION OF POLYPHENOLS, ESSENTIAL OIL AND PECTIN, FROM ORANGE PEEL, CONSIDERING ULTRASONIC ASSISTANCE.

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This study focuses on transforming an Ecuadorian seasonal agro-industrial waste, i.e., orange peel. The orange peel possesses many components of interest; among the more appreciated are polyphenols, essential oil, and pectin, considered food additives. Therefore, orange peel agro-industrial waste may be used as a raw material in conversion processes to obtain resources.

In order to keep the orange peel (biomass) characteristics, it was dried to prevent the attack of microorganisms, and later, according to the molecules, a process line was established. Since most compounds are intracellular, extracting or hydrolyzing from the biomass was necessary. The developed process design allowed the purpose of a sequential production line according to the properties related to each molecule, therefore taking advantage of the treated biomass from the preceding process; importantly, we integrated the ultrasonic bath into each stage, 3 in total. The process line (stage 1) starts with an extraction line for polyphenol, continues with an extraction of essential oil (stage 2), and finishes (stage 3) with a hydrolysis to recover the pectin. We have determined that the best-suited solvent for polyphenol was a mix of ethanol and water (50:50) with a yield of 37.55%; in the second stage, hexane was used as a solvent. The analyzed molecule was limonene, which reported a concentration of 22,9 ppm with a yield of 33,61% of essential oil. Finally, in stage 3, hydrolysis was utilized with a yield of 53.56% for pectin. The frequency of the ultrasonic bath was kept at 42 kHz and 200 W for all cases. The results suggest that oranges peel waste is a promising residual biomass for the biotech industry; it could generate resources, employment and may replace imports of food additives.

Keywords: Orange peel waste, essential oil, polyphenol, pectin, ultrasonic bath.