INTRODUCTION

Justicia secunda Vahl., a native tropical herb originated from South America, is cultivated by village people in tropical countries to prepare medicinal beverages. In Côte d’Ivoire, water-extracts of plant leaves were traditionally homemade to cure various illnesses such as anaemia or hypertension. A pilot plant coupled-process was developed, mimicking the traditional recipes using plant leaves, to prepare functional and active polyphenol concentrated extracts with antioxidant properties. For better stability and longer shelf-life, the end-product was turned into powder, using comparatively 2 drying technology.

EXTRACTION-STABILISATION PROCESSING

- The substrate
  - Fresh leaves of J. secunda were harvested around Yamoussoukro area (centre area of Côte d’Ivoire). They were dried locally at 30 °C during day time, under an open-sided shed.

- The pilot plant scale process
  - Ultrasound-Assisted water-Extraction - UAE (1.25kg dried leaves, 100 L acidified water 0.01N citric acid, 30min, 40 kHz), was used to extract water-soluble compounds within a reduced maceration time.
  - Membrane clarification and concentration of the crude filtrate obtained was made at room temperature, using Cross Flow Microfiltration - CFM (industrial P19-60 ceramic membrane) coupled to Reverse Osmosis – RO (industrial SW30-2540 membrane).
  - End-product stabilisation was obtained by drying the concentrated RO extract into powder, using Spray-Drying or Freeze-Drying.

RESULTS and DISCUSSION

- Analysis
  - Total Polyphenol Contents – TPC were determined at λ=760 nm using to the Folin-Ciocalteau method. Total Flavonoid Content - TFC was determined by HPLC-DAD peak surface ratio.
  - AntiOxidant Capacity – AOC was measured using 2 methods i) the Oxygen Radical Absorbance Capacity assay (ORAC), using the AAPH radical to degrade fluorescein in the presence of the protective antioxidant leaf-extract sample. Fluorescence kinetic was followed at λ=485nm and 535nm (emission and excitation wavelengths), and ii) the Total Equivalent Antioxidant Capacity (TEAC) using the ABTS+ radical discoloration kinetic at λ=734 nm.
  - HPLC-DAD polyphenol analysis showed a 25-peak profile at λ=325 nm. Peaks 4, 10, 13, 17-20, and 22-25 displayed in their UV-vis spectra the 2 specific absorption bands for flavone-type compounds (300-400nm and 240-285nm). They represented 42% of the total polyphenol peak area recorded.

Two major flavonoid compounds (peaks 17 and 22) accounted for 64% of the total peak surface of the flavone-type compounds. Their chemical structures were determined by LC-ESI- and NMR analysis.

- Extraction and concentration process
  - The coupled-process applied, lead to concentrated (28 times) water-extracts and dried end-products. Concentration factors of TPC, TFC and AOC (15 - 21) were slightly lower than the volume reduction factor (28), showing that this process preserved the quality of the concentrated extracts obtained.

- Drying effect on AOC of powders 1 and 2
  - RO concentrates were dried into powders, using comparably spray-drying and freeze-drying. Recovery of polyphenol contents (TPC, TFC) and of AOC in powders, were generally better than 70% : freeze-drying gave better recovery yields (>90%) than did spray-drying (71-78%).

CONCLUSION

A pilot plant scale eco-friendly and multi-step process allows producing powders of natural polyphenol compounds with interesting antioxidant capacities. The optimised processing conditions, including reduced operation time and membrane concentration at room temperature of water-extracts of J. secunda leaves, lead to end-products as concentrated liquids or powders, with little AOC losses of extracted polyphenol compounds. The powder format of leaf water-extracts could be a potential advantage for preservation of its quality during storage and marketing of this traditional medicine at the village level in tropical countries.

REFERENCES


AFFILIATION

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