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TOPIC(s) : Waste valorization

Potato by-products as a source of natural chlorogenic acids and phenolic compounds: extraction, characterization and antioxidant capacity

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PURPOSE OF THE ABSTRACT

Vegetal raw material processing generates large quantities of by-products which are an affordable, and valuable starting material for the extraction of value added compounds such as dietary fiber, natural antioxidants, biopolymers, and natural food additives. In addition to the co-products of the milling, the oil, dairy, sugar industries and other food manufactories, the potato starch industry is promising.

In several countries, potatoes (*Solanum tuberosum* L.), are one of the most important basic crops for human consumption, together with wheat, rice, and corn.

By-products derived from the potato processing can be divided into two major categories: cull or discarded potatoes, and potato processing waste. Both discarded tubers and potato by-products represent an issue to the potato industry, since they are easily degraded by microorganisms. These co-products are then concentrated and/or dried to be proposed as cattle feed or as a source for biofuel-production or biotechnological issues (as substrate for microbial and enzymatic fermentation or cell production).

On the other side, and in view of the growing rejection of synthetic food additives by consumers, functional ingredients obtained from natural sources may be a promising alternative. The use of by-products also contributes to reduced amounts of waste and thus to sustainable production.

In the potato process, peels, which are the major portion of processing wastes, contain a spectrum of nutritionally and pharmacologically interesting components such as phenolic compounds (chlorogenic acids, ascorbic acid, flavonoids), glycoalkaloids, cell wall polysaccharides, and dietary fiber. Moreover some researches used potato peel as a low-cost agro-industrial medium in production of both alpha-amylase and alkaline protease enzymes, respectively, to be used as detergents. Potato peels have been shown to contain several important and high added-value phenolic antioxidants, which may be used as natural antioxidants that can substitute for synthetic ones.

The present work was undertaken to examine the potential utilization of potato by-products considering: (i) study the extraction of phenolic compounds, especially chlorogenic acids (CQA, Fig.1), from variety starch potato peel, flesh potato, liquid pulp, lyophilized one and red water from potato processing, (ii) evaluate antioxidant activity of potato by-product extracts using the total Oxygen Radical Absorbance Capacity (ORAC) methodology.

The total phenolic compounds (TPC) were extracted from potato by-product using hydroalcoholic solvents (methanol, ethanol) and two mainly extraction methods (solvent maceration and heating-assisted extraction). TPC and CQA contents were quantified according to the Folin-Ciocalteu procedure and HPLC, respectively.

Highest content of TPC, i.e. 57mg/g fresh weight, were found in raw and lyophilized red liquid when using ethanol as a solvent. Heating assisted-extraction process increased the extraction yield. Under specific extraction conditions, unpeeled potato samples exhibit a higher TPC than those peeled, showing that TPC is accumulated in

skin tissue.

The greatest amount of CQA, mainly the 5-CQA (around of $870 \pm 39.7 \mu\text{g/g}$), was obtained in the pellets and lyophilized fresh peels (skin vs flesh). In addition, the greatest amounts of CQA were obtained with potato peels when using methanol as a solvent. Moreover, the heating assisted-extraction improved the 5-CQA concentration from the potato peel.

The ORAC values recorded varied between 1500 - 1650 $\mu\text{M TE/g}$ whatever the potato fractions are. Results were higher than those of some fruits, vegetables, nuts, cereals and sweet potato cultivar. The degree of correlation between TPC, CQA determination and ORAC capacity indicates that the TPC can be used as an indicator of antioxidant evaluation of potato by-products and would be an easy tool for qualifying enriched potato fractions for Human or animal food and nutrition purposes.

FIGURES

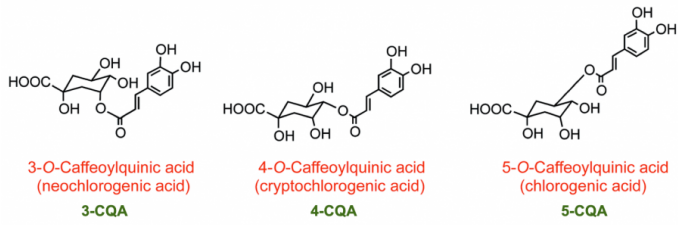


FIGURE 1

Chemical structures of chlorogenic acids (CQA)

Structures of the 3 CQA isomers contained in phenolic extracts of potato by-products

FIGURE 2

KEYWORDS

Potato by-products | Phenolic compound extraction | chlorogenic acids | antioxidant activity

BIBLIOGRAPHY