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Natural food ingredients from quince peel: Towards a "zero-waste" production system

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Quince is the yellow fruit of the deciduous tree *Cydonia oblonga* Mill. Its taste is sour and astringent when eaten raw, so it is usually processed into marmalade and many other food products, mostly sweets, through processes that discard the peel as a by-product. Therefore, this work was carried out to promote the upcycling of quince peel into valuable food ingredients following a "zero waste" approach. A response surface methodology (RSM)-coupled experimental design with 20 runs, combining five levels of time (1–120 min), temperature (25–95 °C) and ethanol concentration (0–100%), was implemented for maximizing the extraction of soluble solids and malic acid while simultaneously obtaining fiber concentrate extracts. The yields of soluble solids and fiber concentrate extracts were determined gravimetrically. Malic acid, which has been used as a food preservative, was analyzed by ultra-fast liquid chromatography with photodiode array detection.[1] The dietary fiber content of the fiber concentrate extracts was determined by an enzymatic-gravimetric method (AOAC Official Method 985.29) and their color was measured with a portable colorimeter.[2,3] The three independent variables affected significantly the extraction process and the predictive model equations were validated based on different statistical criteria, which allowed to determine the optimal extraction conditions. In general, the soluble solids yield was promoted by lower temperatures and ethanol concentrations, while malic acid was better extracted at higher temperatures for longer processing times. In turn, the fiber concentrate extracts remaining after extraction had opposite yields to the soluble solids. However, the highest yields of these fiber concentrates were not in agreement with their dietary fiber contents. The highest fiber values were recorded in the concentrate extracts obtained at high temperatures and medium-low ethanol concentrations. In fact, only these two independent variables significantly impacted its extraction, through linear, quadratic, and also interactive effects. Furthermore, the lighter fiber concentrate extracts were those with the highest yields. Overall, quince peel can be totally upcycled into natural food ingredients rich in malic acid and dietary fiber.

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