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Studying the Effect of Reducing Thermal Processing over the Bioactive Composition of Non-Centrifugal Cane Sugar: Towards Natural Products with High Therapeutic Value

Authors : Laura Rueda-Gensini, Jader Rodríguez, Juan C. Cruz, Carolina Munoz-Camargo

Abstract : There is an emerging interest in botanicals and plant extracts for medicinal practices due to their widely reported health benefits. A large variety of phytochemicals found in plants have been correlated with antioxidant, immunomodulatory, and analgesic properties, which makes plant-derived products promising candidates for modulating the progression and treatment of numerous diseases. Non-centrifugal cane sugar (NCS), in particular, has been known for its high antioxidant and nutritional value, but composition-wise variability due to changing environmental and processing conditions have considerably limited its use in the nutraceutical and biomedical fields. This work is therefore aimed at assessing the effect of thermal exposure during NCS production over its bioactive composition and, in turn, its therapeutic value. Accordingly, two modified dehydration methods are proposed that employ: (i) vacuum-aided evaporation, which reduces the necessary temperatures to dehydrate the sample, and (ii) window refractance evaporation, which reduces thermal exposure time. The biochemical composition of NCS produced under these two methods was compared to traditionally-produced NCS by estimating their total polyphenolic and protein content with Folin-Ciocalteu and Bradford assays, as well as identifying the major phenolic compounds in each sample via HPLC-coupled mass spectrometry. Their antioxidant activities were also compared as measured by their scavenging potential of ABTS and DPPH radicals. Results show that the two modified production methods enhance polyphenolic and protein yield in resulting NCS samples when compared to traditional production methods. In particular, reducing employed temperatures with vacuum-aided evaporation demonstrated to be superior at preserving polyphenolic compounds, as evidenced both in the total and individual polyphenol concentrations. However, antioxidant activities were not significantly different between these. Although additional studies should be performed to determine if the observed compositional differences affect other therapeutic activities (e.g., anti-inflammatory, analgesic, and immunoprotective), these results suggest that reducing thermal exposure holds great promise for the production of natural products with enhanced nutritional value.

Keywords : non-centrifugal cane sugar, polyphenolic compounds, thermal processing, antioxidant activity
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