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Influence of processing on physicochemical and antioxidant activity in tea and extracts of *Hibiscus sabdariffa* and *Rosa* powder vs. flower petals

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Abstract

This study investigated the impact of raw material physical form (powder vs. whole petals) and processing time (brewing and ethanol-based extraction) on the physicochemical characteristics and antioxidant properties of tea infusions and ethanolic extracts prepared from *Rosa* spp. originating from Iraq and *Hibiscus sabdariffa* L. sourced from Nigeria and Sudan. Tea infusions were prepared by steeping samples in boiling water for 3, 5, and 10 minutes, while ethanolic extracts were obtained using 60% ethanol over extraction periods of 24, 48, and 72 hours. Antioxidant activity was assessed via the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay and determination of total phenolic content (TPC). Additional analyses included quantification of total anthocyanins, phenolic compounds, pH, colorimetric parameters (L*, a*, b*), and total sugar content.

Results showed rose samples had consistently higher antioxidant activity measured (DPPH and TPC) than both roselle samples, with rose powder generally outperforming flower petals, especially in TPC. Brewing time does not significantly influence TPC and DPPH in both rose and roselle teas. In ethanolic extracts, rose also maintained superior antioxidant activity, while roselle from Nigeria showed higher antioxidant activity in the powder form in response to extraction duration compared to roselle from Sudan. pH values were lower (more acidic) in roselle than in rose (less acidic), with powder forms typically more acidic than flower petals. Colour values varied significantly by physical form, with powder producing deeper red colours and flower petals resulting in higher lightness (L*). Sugar content (glucose and fructose) was generally higher in rose than roselle and was more influenced by physical form (powder) in tea than in extracts.

These findings indicate that physical form and processing time have a considerable influence on the antioxidant activity and physicochemical properties of rose and roselle beverages, which may help in human nutrition and also improve the use of both plants in the food system and guide their optimal use in functional food applications.

Keywords: DPPH, extract, L*a*b, pH, rose, Roselle, sugar, tea, TPC

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