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Subcritical water extraction of phenolic compounds from coconut cake

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Subcritical water (SCW) extraction of phenolic compounds in coconut cake (CC) was performed in a home built apparatus. Phenolic substances from powdered CC (0.5 g) were extracted at different temperatures; room temperature (RT), 100 °C, 150 °C and 200 °C at pressure of 20 bar. Total phenolic content (TPC) of the extracts were determined using the Folin-Ciocalteu method and the antioxidant activity was tested using ferric reducing antioxidant power (FRAP) assay and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid (ABTS) assay. The antioxidant efficacy was also tested in egg yolk homogenate as a food model. Two conventional extraction methods (vortex and sonication) at RT were also performed. The results are summarized in Table 1.

Table 1: Total phenolic content, antioxidant activity and % inhibition in egg yolk homogenate

Extraction conditions	TPC- g (Gallic acid equivalents)/ kg	FRAP% assay - Reducing Power %	ABTS assay- Trolox Equivalents ($\mu\text{mol} / \text{g}$)	Egg yolk homogenate- Inhibition %
20 bar, RT	1.53 \pm 0.13 ^{ab}	66 \pm 20 ^{ab}	26 \pm 4 ^a	16 \pm 5 ^{ab}
20 bar, 100 °C	1.74 \pm 0.08 ^{ac}	74 \pm 14 ^a	27 \pm 7 ^a	18 \pm 2 ^a
Sub critical, (20 bar, 150 °C)	1.87 \pm 0.21 ^c	119 \pm 30 ^{ac}	47 \pm 6 ^b	20 \pm 2 ^a
Sub critical, (20 bar, 200 °C)	2.36 \pm 0.10 ^d	169 \pm 27 ^c	77 \pm 3 ^c	38 \pm 6 ^c
Vortexed, RT	1.59 \pm 0.12 ^{ab}	78 \pm 8 ^{bd}	60 \pm 6 ^d	11 \pm 3 ^b
Sonicated, RT	1.46 \pm 0.17 ^b	69 \pm 9 ^d	53 \pm 4 ^{bd}	11 \pm 1 ^b

Different superscript letters in same column denote significant difference at 95 % level by Tukey's pair-wise comparison.

TPC obtained using high temperature and high-pressure conditions are significantly ($p < 0.05$) higher than that of the extracts obtained at RT (Table 1). Phenolic extracts obtained using SCW have exhibited significantly ($p < 0.05$) higher % reducing power than other extracts. In ABTS assay and egg yolk homogenate, SCW extract (20 bar, 200 °C) has shown significantly ($p < 0.05$) higher antioxidant activity and % inhibition than other extracts. Hence, subcritical conditions can be used to obtain higher phenolic yields with higher antioxidant activity and thereby to extend the shelf life of foods processed under high temperature.

Keywords: Antioxidant activity, coconut cake, phenolic compounds, subcritical water

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