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Antioxidant and anti-diabetic properties of *Caryota urens* (Kithul) flour

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Abstract

Starch extracted from pith of *Caryota urens* L. (Family: Arecaceae) palm is known as “Kithul flour” and is claimed to have health benefits according to folklore and Ayurveda. Antioxidants are believed to possess numerous health benefits. However, as yet, health benefits of *C. urens* flour have not been scientifically investigated. Antioxidant properties of *C. urens* flour were tested using different *in vitro* assays namely, 2,2-azino-bis 3-ethylbenzothiazoline-6-sulfonic acid (ABTS⁺), ferric reducing antioxidant power, oxygen radical absorbance capacity and ferrous ion chelating assays. Total Phenolic Content (TPC) and Total Flavonoid Content (TFC) were also evaluated. Anti-diabetic properties were estimated using alpha amylase and alpha glucosidase enzyme inhibition assays. Dried methanolic extracts of both boiled and raw samples were used in all assays. Results of the study showed that *C. urens* flour possess free radical scavenging activity (raw 0.02 ± 0.01 and boiled 0.04 ± 0.01 mg trolox equivalent (TE)/ g flour), electron donating reducing power (raw 0.10 ± 0.03 and boiled 0.36 ± 0.11 mg TE/g flour), oxygen radical absorbance capacity (raw 2.29 ± 0.71 and boiled 192.3 ± 57.71 mg TE/1g flour) and metal ion chelating capacity (raw 0.03 ± 0.01 and boiled 0.14 ± 0.04 mg EDTA equivalents /g flour) exhibiting its antioxidant potential. TPC (raw 1.1 ± 0.3 and boiled 5.12 ± 1.89 mg GAE/g flour) and TFC (raw 1.65 ± 0.47 and boiled 6.69 ± 1.27 μ g QE/g flour) which are said to be contributed to antioxidant activities were also found. In addition, boiled flour which is generally consumed as a food has shown higher antioxidant activity. *Caryota urens* flour did not contain marked anti-diabetic properties. It is evident from results that *Caryota urens* flour has moderate antioxidant property which may associate with its traditional health claims.

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1. Introduction

Caryota urens L. (Family Arecaceae) is an underutilized palm species which is native to low land forests of tropical Asia including India, Malaysia and Indonesia and is popular as *Kithul* in Sri Lanka. Jaggery, treacle and toddy (fermented beverage) are produced from sap of the young inflorescence of *C. urens*. It is a multipurpose palm which provides strong fibre, woody stems for building materials and healthy food from starch which is extracted from the pith of the stem. *Caryota* flour is mixed with *Caryota* syrup to produce locally esteemed porridge and sweetmeats, which are commonly used in festival days in Sri Lanka. In India, stem starch of *C. urens* represents a food source among some tribal peoples.

Inflorescence sap of *Caryota urens* and sap based products possess health promoting properties, according to folkloric knowledge and are used in treatments in the ayurvedic medical system practiced in Sri Lanka. Several studies have been done on analysis of *C. urens* sap and sap based products¹. Free radicals are molecules or molecular fragments which contain one or more unpaired electrons and involve in the pathogenesis of certain human diseases including Alzheimer's disease, Parkinson's disease, Cancer, Down's syndrome, atherosclerosis and ageing.

Protection against free radicals can be enhanced by improving the dietary intake of antioxidants. Antioxidants are capable of slowing or preventing the oxidation of other molecules, thereby protecting cells from damages caused by exposure to reactive oxygen species (ROS) which are produced during normal oxidation reactions in biological cells.

Traditionally claimed health benefits of *C. Urens* flour may be contributed with its antioxidants and anti-diabetic properties. However, these bioactive properties of *C. Urens* flour have not reported. Therefore, in this study antioxidant and anti-diabetic properties *Caryota urens* flour was evaluated.

2. Methodology

2.1 Collection and storage of *Caryota urens* flour samples

Pure *Caryota urens* flour samples were collected from seven different locations around UvaParanagama area (6.95 °N, 80.88 °E and 1100 m above MSL) in Badulla district, Sri Lanka. Samples were sealed, labelled and stored at - 20 °C temperature.

2.2 Treatments

Raw and boiled *Caryota urens* flour samples were used as two treatments.

2.3 Preparation of extracts

In first treatment (T₁), dried flour samples were extracted by weighing samples of 10 grams of finely ground flour and extracting with 100 mL of methanol GR (99.8% Assay GC). In second treatment (T₂), the same amount from each sample was boiled with 100 mL of hot distilled water and then extracted with 100 mL of methanol.

Samples were sonicated for 2 hours in a digital heated ultrasonic bath at 50 °C followed by concentration using rotavapor. Extracts of T₁ were dried using sample concentrator at 45 °C. Extracts of T₂ were frozen in - 40 °C and dried overnight using freeze dryer. From each extracts, 5 mg/mL concentrated solutions were prepared and stored at - 40 °C.

2.4 Antioxidant and anti-diabetic assays

Antioxidant properties of *C. urens* flour were tested using different *in vitro* assays. Free radical scavenging activity was measured using 2,2-azino-bis(3-ethylbenzothiazoline-6-sulfonic (ABTS⁺) radicals based on the methods

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