Clinical Medicine Research Journal
ISSN: 2997-4062|
Volume 10 Issue 1, January-March, 2022
Journal Homepage: https://ethanpub.online/Journals/index.php/E12
Official Journal of Ethan Publication

BONSUPARI (CARYOTA URENS L.): A TREASURE TROVE OF BIOLOGICAL ACTIVITIES

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Abstract

Caryota urens L., commonly known as the Fishtail palm or Bonsupari in Bengali, is a plant with diverse medicinal properties. Traditionally utilized for treating gastric ulcer, migraine, rheumatic swellings, snake bites, and tooth ailments, this plant has garnered attention for its therapeutic potential. Recent scientific investigations have revealed the nutritional richness of C. urens sap, which contains a mixture of simple sugars such as sucrose, glucose, and fructose. Additionally, flavonoids have been isolated from the methanol extract of its fruits. Moreover, research conducted in recent years has unveiled the significant antioxidant, anti-diabetic, and anti-microbial activities exhibited by C. urens. With its roots deeply embedded in traditional medicine and promising scientific evidence supporting its medicinal properties, C. urens emerges as a valuable resource in the realm of natural medicine. This paper aims to provide a comprehensive overview of the medicinal attributes of C. urens, highlighting its traditional uses and scientific advancements in understanding its pharmacological potential.

Keywords: Caryota urens, Fishtail palm, Medicinal properties, Traditional medicine, Pharmacological potential

INTRODUCTION

Caryota urens L. (English name: Fishtail palm, Bengali Flower is useful in gastric ulcer and migraine. Bark is name: Bonsupari) belongs to Arecaceae family. The plant used to treat rheumatic swellings and snake bite (Charles is a native of India, Myanmar and Sri lanka 2011; Uddin et al., 2015). Recent scientific 2015). Traditionally root is used to treat tooth ailments. investigations report that C. urens sap is nutritionally rich and contains mixture of simple sugars such as sucrose, glucose and fructose (Somasiri et al., 2008). Flavonoids have been isolated from the methanol extract of the fruits (Srivastav et al., 2015). The plant has been reported to possess significant antioxidant, anti-diabetic and anti-microbial activities in the last few years (Charles and Ramani, 2011; Ranasinghe et al., 2012; Krishnamoorthy et al., 2013; Azam et al., 2016; Wimalasiri et al., 2016; Sujitha and Kripa, 2018).

In investigating Bangladesh medicinal plants (Sharmin et al., 2017-2018), the crude methanol extract of C. urens fruits in Bangladesh including its organic and aqueous soluble fractions was for the first time evaluated for the

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antioxidant potential based on total phenolic content, phosphomolybdenum total antioxidant activity free radical scavenging activity, cytotoxic, thrombolytic, membrane stabilizing and antimicrobial properties.

MATERIALS AND METHODS

Plant materials

Fruits of C. urens were obtained from Mirpur, Dhaka, Bangladesh. A voucher specimen (DACB-39528) is maintained in Bangladesh National Herbarium, Dhaka, Bangladesh for use in future.

The fruits (800 g) were dried under the sun and ground into powder. It was then macerated in 2.5 L of methanol for one week. It was filtered via fresh cotton bed and with Whatman filter paper number 1. It was concentrated with a rotary evaporator at low temperature and pressure. A modified version of Kupchan partition protocol (VanWagenen et al., 1993) was used to fractionate an aliquot (5 g) of the concentrated methanol extract; the partitionates obtained from there were evaporated to dryness with rotary evaporator. This yielded hexane soluble fraction (HXSF, 1.8 g), carbon tetrachloride soluble fraction CTCSF, 2.0 g), chloroform soluble fraction (CSF, 0.2 g) and aqueous soluble fraction (AQSF, 0.5 g). The residues were kept in a refrigerator for use later.

Total phenolic content

Folin-Ciocalteau reagent was used to determine the total phenolic content by Harbertson and Spayd (2006)'s method developed.

DPPH free radical scavenging assay

Brand-Williams et al. (1995)'s developed method was used to assess the capacity of the study samples to scavenge the stable 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radical. The positive controls were Butylated hydroxytoluene (BHT) and ascorbic acid.

Phosphomolybdenum antioxidant assay

Phosphomolybdenum antioxidant assay method (Prieto et al., 1999) was used to evaluate the total antioxidant activity of the extract.

Brine shrimp lethality bioassay

This was done to determine the overall harmful activities of the dimethyl sulfoxide (DMSO) solutions of plant samples against Artemia salina in one day in vivo assay (Meyer et al., 1982). The positive control was Vincristine sulphate .

Thrombolytic activity

Prasad et al. (2006)'s method was used to evaluate the thrombolytic property. The positive control was streptokinase.

Membrane stabilizing activity

Omale and Okafor (2008)'s method was used to assess the membrane stabilizing property of the samples by analyzing their capacity to prevent hypotonic solution and heat-induced haemolysis of human erythrocytes.

Antimicrobial screening

Disc diffusion method was used to determine antimicrobial property (Bayer et al., 1966).

Statistical analysis

Three replicates of each sample were used for statistical analysis for all bioassays; the values are given as mean ± standard deviation (SD). A two-tailed Student's t-test was used to evaluate the results.

RESULTS

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This research was done to analyze C. urens fruit extract for antioxidant, cytotoxic, thrombolytic, membrane stabilizing and antimicrobial activities.

The crude methanol extract of C. urens fruits have a high content of phenolic principles (106.88±0.19 mg of GAE/g of sample). The extract's total phenolic content and the free radical scavenging activity correlate positively (IC_{50}= 62.74±0.16 µg/m) (Table 1).

All the fractions had significant cytotoxic potential against A. salina in brine shrimp lethality bioassay. The crude methanol extract showed the highest cytotoxic activity with LC_{50} value of 0.59±0.34 µg/mL in comparison to 0.451 µg/mL for Vincristine sulphate (Table 1).

C. urens extract had mild thrombolytic activity. The carbon tetrachloride soluble fraction was 20.48% of clot lysis in contrast to 66.77% clot lysis by streptokinase used as standard (Table 2).

At 1.0 mg/mL, C. urens samples protected the haemolysis of RBC caused by hypotonic solution and heat compared to the standard acetyl salicylic acid (0.10 mg/mL). The crude methanol extract prevented 64.17±0.26% of haemolysis of RBCs induced by hypotonic solution in contrast to 71.9% by acetyl salicylic acid (Table 2).

The antimicrobial activity of C. urens samples was analyzed against five gram positive and eight gram negative bacteria. The results were compared with ciprofloxacin, standard antibiotic. Among all the samples, the carbon tetrachloride soluble fractions against Shigella the largest zone of inhibition (13.0 mm) was displayed by dysenteriae (Table 3).

Table 1. Total phenolic content, phosphomolybdenum total antioxidant capacity, free radical scavenging and cytotoxic activities of C. urens.

Samples/ standards	Total phenolic content (mg of GAE/ g of dried extract)	Free radical scavenging activity IC_{50} (µg/mL)	Total antioxidant capacity (mg of ascorbic acid/100 g of extract)	Brine shrimp lethality bioassay LC_{50} (µg/mL)
ME	106.88±0.19	62.74±0.16	4.0±0.20	0.59±0.34
HXSF	1.45±0.25	387.74±0.46	1.12±0.27	0.71±0.53
CTCSF	7.48±0.18	120.24±0.09	4.0±0.38	3.11±0.12
AQSF	41.42±0.41	-	3.61±0.21	3.51±0.11
Ascorbic acid	-	5.8±0.21	-	-
BHT	-	27.5±0.54	-	-
Vincristine sulfate	-	-	-	0.451±0.04

Table 2. Thrombolytic and membrane stabilizing activities of C. urens.

Samples/standards	% of lysis of RBC	% Inhibition of haemolysis	
		Heat-induced	Hypotonic solution-induced
ME	2.40±0.23	19.01±0.43	64.17±0.26
HXSF	7.70±0.18	6.70±0.14	63.28±0.49
CTCSF	20.48±0.44	10.00±0.27	60.91±0.54
Water	3.79±0.21	-	-
Streptokinase	66.77±0.36	-	-

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Hypotonic medium	-	-	-
Acetyl salicylic acid	-	42.12±-0.38	71.9±0.78

ME = Methanolic crude extract; HXSF= Hexane soluble fraction; CTCSF = Carbon tetrachloride soluble fraction.

Table 3. Antimicrobial activity of C. urens.

Parameter	**Diameter of zone of inhibition (mm)**			
	ME	**CTCSF**	**CSF**	**Ciprofloxacin**
Bacillus cereus	12.0±0.38	-	-	45.0±2.01
B. megaterium	-	-	-	42.0±1.17
B. subtilis	-	-	-	42.0±0.73
Staphylococcus aureus	-	-	-	42.0±0.23
Sarcina lutea	-	-	8.0±0.12	42.0±0.56
Escherichia coli	-	-	-	42.0±0.43
Pseudomonas aeruginosa	-	-	-	42.0±1.11
Salmonella typhi	-	-	-	45.0±0.73
S. paratyphi	-	8.0±0.15	8.0±0.24	47.0±2.33
Shigella boydii	-	-	-	34.0±0.58
S. dysenteriae	-	13.0±0.39	-	42.0±0.22
Vibrio mimicus	8.0±0.22	8.0±0.18	8.0±0.41	40.0±0.45
V. parahaemolyticus	-	-	-	35.0±0.44

ME = Methanolic crude extract; CTCSF = Carbon tetrachloride soluble fraction; CSF = Chloroform soluble fraction.

DISCUSSION

The high phenolic content of C. urens extract might contribute to its antioxidant potentials. Lupeol and ursolic acid have been isolated from the leaf of this plant (Muhaisen, 2013). Both compounds possess antioxidant potentials (Santiago et al., 2014; Tchimene et al., 2016). The antioxidant potential of C. urens extract might be due to the presence of these two compounds. Lupeol has been also found to be a potent cytotoxic component (Moriarity et al., 1998). Therefore, this compound might be responsible for the observed cytotoxic activity.

C. urens extract showed membrane stabilizing property. Leakage of serum proteins and fluid into the tissue causes inflammation. Membrane stabilizing property can prevent induction of inflammation (Chaitanya et al., 2011).

Ursolic acid possesses anti-inflammatory property (Checker et al., 2012; Wang et al., 2018). The presence of this compound in C. urens might contribute to the observed membrane stabilizing activity.

Conclusion

People have the common belief that nature is good. This belief has contributed to the increased popularity of traditional medicines. But consuming plant-based medicines might cause unwanted side effects because such medicines contain a large number of compounds with different activities. This study has revealed that C. urens fruit extract possesses significant antioxidant and membrane stabilizing potentials. Therefore, it is important to identify the compounds responsible for the observed activities from the fruit extract. Thus, the plant is a good candidate for further systematic, chemical and biological studies to isolate the active principles.

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CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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