

Research Article

Anti Inflammatory and Anti Diabetic Activity of *Cocos nucifera* Inflorescence

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Abstract

Lately manufactories with medicinal properties play an important part in food and medicinal diligence for their capacities on disease prevention and treatment. Inflammation is a physiological process involved in the defenses of the body and the form of tissues. Recent years have also seen studies conducted on *Cocos nucifera* inflorescence to ascertain the presence of specific phytoconstituents. The inflorescence of *Cocos nucifera* (L.) have a traditional use as a potent healer of numerous inflammatory diseases like postnatal changes. Food technology grounded explorations are underway to employ its powder as an alternative to wheat flour by esteeming its gluten free nature, nutritive value and natural sweetness. Numerous compounds in *Cocos nucifera* (L.) inflorescence have been shown to possess a range of pharmacological qualities, including antioxidant, anticancer, anti-helminthic, anti-inflammatory, anti-arthritis, and antibacterial activities. Hence objectives of the present study are to estimate the *In vitro* anti-inflammatory activity & *In vitro* anti-diabetic activity of Fresh and the Cabinet dried *Cocos nucifera* inflorescence. *In vitro* anti-inflammatory activity of fresh and Cabinet dried *Cocos nucifera* inflorescence were carried out by heat induced hemolysis method. *In vitro* anti-diabetic activity of Fresh and the Cabinet dried *Cocos nucifera* inflorescence were carried out by α -amylase method. Cabinet dried *Cocos nucifera* inflorescence have shown a better profile of anti-inflammatory & anti-diabetic activity compared to fresh *Cocos nucifera* inflorescence and thus it can be used for therapeutic purposes.

Keywords

Medicinal Plants, Anti-Diabetic, Anti-Inflammatory, Therapeutic

1. Introduction

Functional foods are becoming more and more popular as both a pharmacological agent and a nutritional replacement. There are a number of undiscovered plant compounds with promising biological and pharmacological qualities [1]. Living cells use inflammation as a biological defence mechanism to fend against illnesses caused by bacteria, fungi, viruses, physical agents, and compromised immune systems. It is commonly advised to use medicinal plant extracts as an

alternative to conventional therapeutic approaches when treating inflammatory agents. Natural products derived from foods, herbs, and plants are being extensively researched for their potential health benefits as well as their chemical components' potential for anti-inflammatory properties in clinical trials and lab settings [2].

Hyperglycemia and impaired glucose metabolism are characteristics of type 2 diabetes (T2D), which is a major

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global cause of morbidity and mortality as well as a significant profitable burden [3]. The International Diabetes Federation estimates that 382 million people worldwide had diabetes in 2013, and by 2035, that number is prophesied to binary [4]. The inhibition of α - amylase and α - glucosidase is one medicinal way for treating postprandial hyperglycemia [5]. The enzymes responsible for hydrolyzing carbohydrates, α - amylase and α - glucosidase, break down nutrient starch and convert oligosaccharides into glucose, leading to a elevation in blood sugar level after feeds. Hence, one of the main strategies for treating T2D patients' hyperglycemic situations is to suppress the activities of α - amylase and α - glucosidase [6].

The Coconut plant is a multipurpose tree with enormous advantages to humankind. A "Coconut" is actually the seed or fruit of the coconut palm. The Coconut palm, or Scientific name *Cocos nucifera* L., is a monocotyledon that's a member of Arecaceae (Palmae) family. One of nature's wonders is regarded to be the coconut palm. In India, it is appropriately worshipped as "Kalpavriksha," a mythical tree said to fulfil all wishes and to be "the tree that offers all the essentials of life." Because of its benefits and adaptable nature, it has been dubbed the "Tree of life" or "Tree of heaven" by Filipinos, the "Tree of abundance" or "Three generations tree" by Indonesians, and many other names [7].

With its numerous applications, Coconut [*Cocos nucifera* (C. nucifera) [L.] is referred as "tree of life" and is a significant fruit tree in the world, feeding millions of people, particularly in tropical and subtropical areas [8]. From the first blossom until the ripe nut, a coconut palm can have up to twelve distinct crops of nuts at any point in time. Coconut products have been an important and valued part of Indian traditional medicine for thousands of years. According to Ngo-Hoang [9], it has anti-blennorrhagia, anti-bronchitis, febrifugal, and anti-gingivitis properties.

Thus the goal of this research is to estimate the amount of *In vitro* anti inflammatory and *In vitro* anti diabetic activity in both of the fresh and cabinet dried *Cocos nucifera* inflorescence. The present study is carried out by the following objectives:

- 1) To estimate *In vitro* anti inflammatory activity of *Cocos nucifera* inflorescence
- 2) To determine *In vitro* Anti diabetic activity of *Cocos nucifera* inflorescence
- 3) To analyse the therapeutic efficacy of *Cocos nucifera* inflorescence
- 4) To evaluate and summarize the results

2. Materials and Methods

Selection and collection of Cocos nucifera inflorescence

Cocos nucifera inflorescence have many positive impacts on health, especially for wound healing, because of their active substance. *Cocos nucifera* inflorescence are known to be antimicrobial, anti tumoral, and antioxidants [10]. *Cocos*

nucifera inflorescence is a nutritional powerhouse, packed with essential vitamins, minerals, and antioxidants [11]. It's an excellent source of dietary fiber, providing support for digestive health. Additionally, it's abundant in vital nutrients such as potassium, iron, and vitamin C, making it a valuable addition to diet [12].

The *Cocos nucifera* inflorescence were collected from the coconut tree in Kerala by the coconut tree climbers. The selected *Cocos nucifera* Inflorescence should not be matured, it should be tender. Coconut flower should be unopened from its covering during September 2023. It was authenticated by Scientist 'F' Dr. K.Karthigeyan Botanical survey of India, Coimbatore and letter No. BSI/SRC/5/23/2023/Tech-176 for *Cocos nucifera* L.

Processing of Cocos nucifera inflorescence fresh

The extraction method known as maceration involves placing coarsely ground medicinal material—such as leaves, stem bark, or root bark—into a container and forcing the menstruum over the top until the container is completely filled with the medicinal material. The vessel is also closed and kept for at least three days. The content is agitated periodically, and if disposed inside bottle it should be agitated time to time to ensure complete extraction. At the end of extraction, the micelle is parted from marc by filtration or decantation. latterly, the micelle is also separated from the menstruum by evaporation in an oven or on top of water bath. This system is accessible and veritably suitable for thermolabile manufactory raw material [13]. Through this extraction technique *Cocos nucifera* inflorescence extract is taken.

Processing of Cocos nucifera inflorescence cabinet dried

The sample was first visually examined for any kind of infection, spores, damage, discoloration, and distortion. The *Cocos nucifera* inflorescence must be unopened and fresh. After freshly opening the inflorescence the grains are carefully separated grain by grain from the stem. Undamaged grain samples were completely washed with tap water, also washed out utilizing distilled water. For the minimal nutrient loss and maximum utilization, cabinet drying method is the best. *Cocos nucifera* inflorescence grains were cabinet dried for 24hours at 45°C.

In vitro Anti-Inflammatory Activity

Heat-Induced Hemolysis

The technique had been preliminarily described by Shinde et al. (1999) and hardly modified and followed by Henneh et al. (2018). The response admixture (2ml) sorted of 1.0 ml of 10 HRBC and 1 ml of varied solvents plant extracts (1 mg/ ml), which was subjoined to each test tubes and gently mixed. The positive control conformed of 1.0 ml of HRBC and 1.0 ml of varied concentrations of diclofenac sodium (10 to 50 μ g/ ml). The negative control conformed of 1.0 ml of 10 erythrocyte suspension and 1.0 ml of common saline alone. The test was performed in triplets. The resulting solution was heated at 56 °C for 30 minutes and chilled to room temperature and centrifuged at 2500 rpm for 10 minutes. The

supernatant was collected and the absorbance of each result was measured spectrophotometrically (UVmini 1240, Shimadzu) at 560 nm as an index of the degree of haemolysis [14]. The percentage inhibition of hemolysis was calculated applying the formula

$$\% \text{ of inhibition} = \frac{A_c - A_t}{A_c} \times 100$$

Where 'Ac' is the absorbance of the control and 'At' is the absorbance of the test.

In vitro anti-diabetic activity

Inhibition assay for α -amylase activity

α - amylase were premixed with the extract at varied concentrations (50-250 $\mu\text{g}/\text{mL}$) and starch as a substrate was added to it (0.5 starch solution) to start the reaction. The reactions were carried out at 37 $^{\circ}\text{C}$ for 5 min and completed by addition of 2 mL of DNS (3,5- dinitrosalicylic acid) reagent. The reaction admixture were heated for 15 min at 100 $^{\circ}\text{C}$ and diluted with 10 mL of distilled water in an ice bath (Miller, 1959). α - amylase activity were determined by measuring the spectrum at 540 nm. The IC_{50} value were defined as the concentration of α - amylase inhibitor to inhibit 50% of its activity under the assay conditions [15].

$$\% \text{ of inhibition} = \frac{A_c - A_t}{A_c} \times 100$$

Where 'Ac' is the absorbance of the control and 'At' is the absorbance of the test.

3. Results

In vitro Anti-Inflammatory Activity

Table 1. Heat-Induced Hemolysis of *Cocos nucifera* inflorescence.

Extracts	% of Inhibition		% Scavenging activity IC_{50} ($\mu\text{g}/\text{mL}$)
<i>Cocos nucifera</i> inflorescence (Fresh)	50 μL	20.48	108.14
	100 μL	23.86	
	150 μL	25.86	
	200 μL	31.13	
	250 μL	36.61	
<i>Cocos nucifera</i> inflorescence (Cabinet dried)	50 μL	20.48	124.55
	100 μL	25.86	
	150 μL	30.45	
	200 μL	35.02	
	250 μL	38.84	

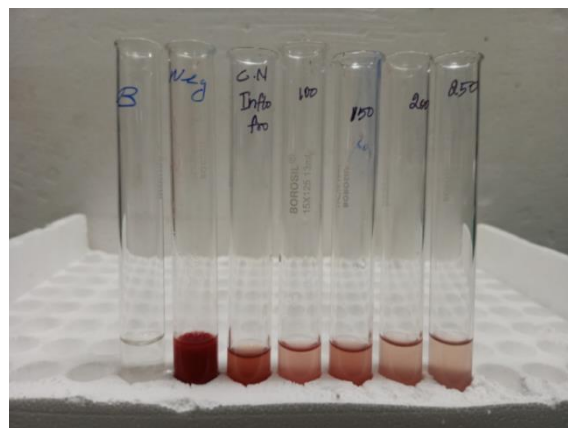


Figure 1. Fresh *Cocos nucifera* inflorescence.

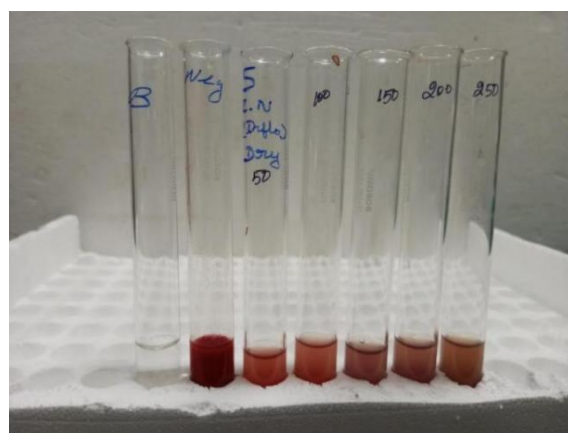


Figure 2. Cabinet dried *Cocos nucifera* inflorescence.

Table 1 depicts the anti-inflammatory activity of fresh and cabinet dried *Cocos nucifera* inflorescence. Heat induced hemolysis activity in fresh *Cocos nucifera* inflorescence (20.48%, 23.86%, 25.86%, 31.13%, 36.61%) & cabinet dried *Cocos nucifera* inflorescence (20.48%, 25.86%, 30.45%, 35.02%, 38.84%). The total % scavenging activity of *Cocos nucifera* inflorescence in fresh is 108.14 $\mu\text{g}/\text{mL}$ and in cabinet dried *Cocos nucifera* inflorescence is 124.55 $\mu\text{g}/\text{mL}$.

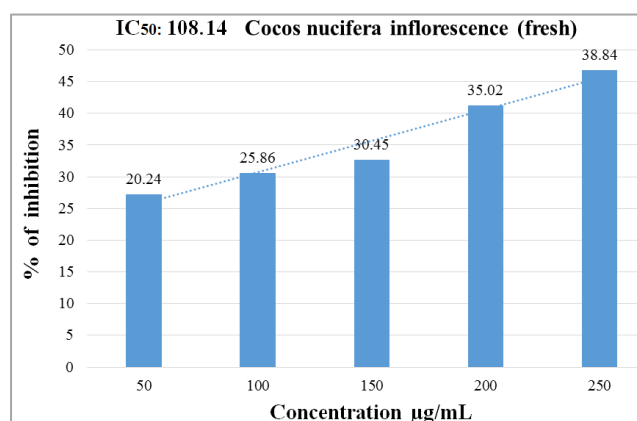


Figure 3. % of inhibition in Fresh *Cocos nucifera* inflorescence.

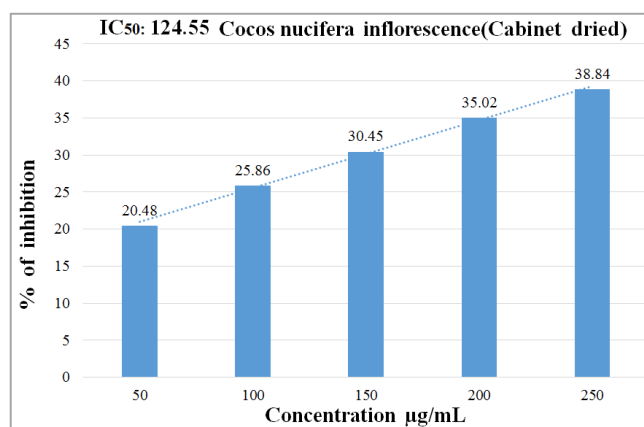


Figure 4. % of inhibition in Cabinet dried *Cocos nucifera* inflorescence.

In vitro anti-diabetic activity

Table 2. Inhibition assay for α -amylase activity of Sample.

Extracts	% of Inhibition		% Scavenging activity IC ₅₀ (µg/mL)
<i>Cocos nucifera</i> inflorescence (Fresh)	50µl	28.77	65.51
	100µl	32.76	
	150µl	43.12	
	200µl	50.16	
	250µl	59.17	
<i>Cocos nucifera</i> inflorescence (Cabinet dried)	50µl	22	88.54
	100µl	28.77	
	150µl	32.76	
	200µl	43.33	
	250µl	47.52	

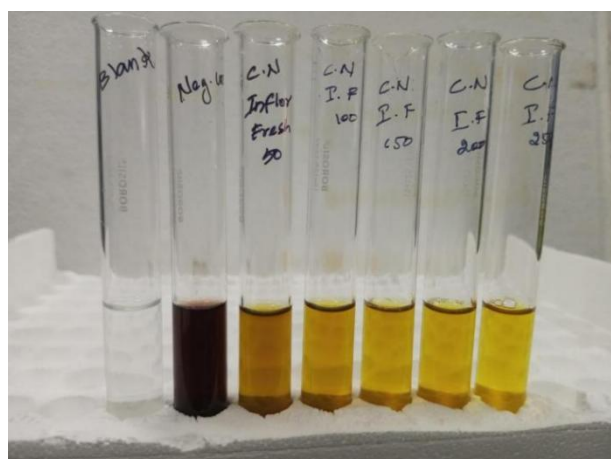


Figure 5. Fresh *Cocos nucifera* inflorescence.

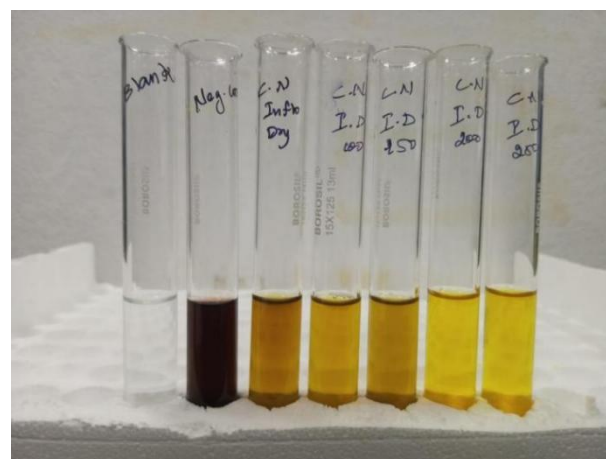


Figure 6. Cabinet dried *Cocos nucifera* inflorescence.

Table 2 depicts the anti-diabetic activity of fresh and cabinet dried *Cocos nucifera* inflorescence. Inhibition assay for α -amylase activity in fresh *Cocos nucifera* inflorescence (28.77%, 32.76%, 43.12%, 50.16%, 59.17%) & cabinet dried *Cocos nucifera* inflorescence (22%, 28.77%, 32.76%, 43.33%, 47.52%). The total % scavenging activity of *Cocos nucifera* inflorescence in fresh is 65.51µg/mL and in cabinet dried *Cocos nucifera* inflorescence is 88.54µg/mL.

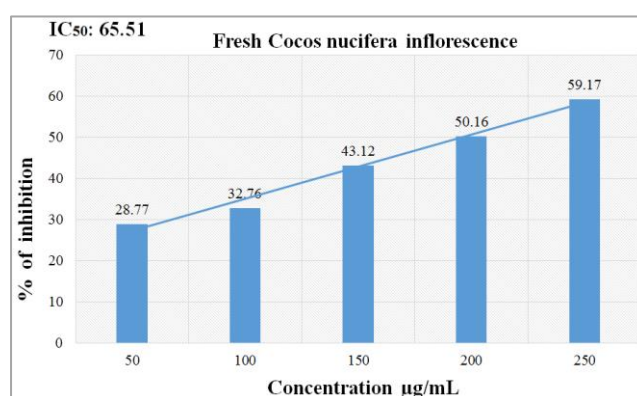


Figure 7. % of inhibition in Fresh *Cocos nucifera* inflorescence.

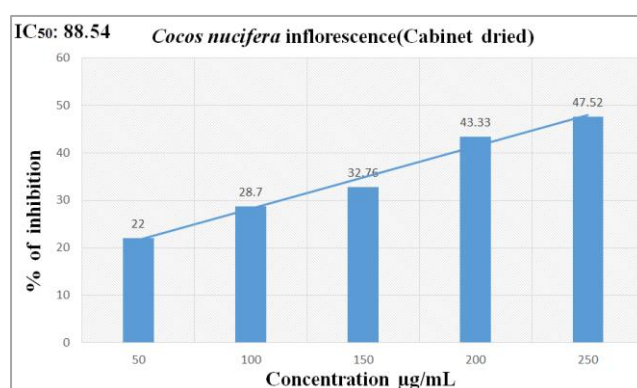


Figure 8. % of inhibition in Cabinet dried *Cocos nucifera* inflorescence.

4. Discussions

There are numerous approaches to estimate the anti-inflammatory action of medicines and anti-diabetic activity. The extract was potent in reducing the heat-induced hemolysis at varied concentrations. The effects showed off that ultimate inhibition was with aqueous extract of cabinet dried *Cocos nucifera* inflorescence with 38.84% at 250 µl/ml compared to fresh *Cocos nucifera* inflorescence with 36.61% at 250 µl/ml. The results showed that the anti-diabetic effectively inhibited the α -amylase enzyme activity with a maximum inhibition of fresh *Cocos nucifera* inflorescence with 59.17% at a concentration of 250 µg/ml compared to cabinet dried *Cocos nucifera* inflorescence with 47.52%.

5. Conclusion

Throughout the history, plants, minerals, and animals have been the primary suppliers of medications, and people have utilised medicinal plants for therapeutic purposes. Antihelminthic, anti-inflammatory, antinociceptive, antioxidant, antifungal, antibacterial, and anticancer properties are among the biological effects of *C. nucifera* components. By easing the strain on the pancreas and the body's enzyme systems, *cocos nucifera* inflorescence lowers the incidence of pancreatitis and diabetes, lessens issues related to cystic fibrosis and malabsorption syndrome. According to the result of present study, aqueous extract of cabinet dried *Cocos nucifera* inflorescence had the highest *In vitro* anti-inflammatory activity and *In vitro* anti-diabetic activity compared to the aqueous extract of fresh *Cocos nucifera* inflorescence.

Abbreviations

Not applicable.

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Consents for Publication

Not applicable.

Author Contributions

The research study was solely conducted by the author Nikhila P. Vinod under the guidance of Dr. D. Jancy Rani. Collection of materials and raw ingredient were done primarily. Processing of the ingredient and the procedures of analysis were done within 7 days of time period.

Nikhila Pappanghat Vinod: Conceptualization, Resources, Data curation, Software, Formal Analysis, Investigation, Visualization, Methodology, Writing – original draft

Devasahayam Jancy Rani: Funding acquisition, Supervision, Validation, Project administration, Writing – review & editing

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Data Availability Statement

Not applicable.

Conflicts of Interest

The authors declare no conflicts of interest.

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