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CARDIOTONIC ACTIVITY OF COCONUT WATER (*COCOS NUCIFERA*)

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ABSTRACT

The coconut (*Cocos nucifera*) is a member of the family Arecaceae. Present plant has been evaluated for antimalerial, antiviral, antifungal and hypoglycemic activity. Hexane fraction of coconut peel and coconut milk has been proved its use in the treatment of cancer and indomethacin-induced ulceration respectively. Present study was undertaken to raise pharmacological significance of *cocos* with Cardiotonic activity based on high potassium and antioxidants contents of coconut water. In the present study, undiluted (T1) and diluted (T2) fresh coconut water (coconut water: distilled water 1:1), were evaluated for cardiac activity on the isolated frog heart and compared with Digoxin (S1) as standard solution. It was found that T1 showed enhanced response over T2. These preliminary studies substantiate the Cardiotonic activity of the *Cocos nucifera*.

Key Words: Cardiotonic activity, Digoxin, *Cocos nucifera*, Isolated frog heart.

INTRODUCTION

Cardiac disease is an important cause of premature death in industrialized countries. Cardiovascular diseases are increasingly becoming one of the leading diseases causing morbidity and mortality. Cardiac glycosides and catecholamines have been used as main therapeutic agents in the treatment of congestive cardiac failure. Despite continuing advances in understanding the basic pharmacology of cardiac glycosides, digitalis intoxication remains a common clinical problem. It necessitates research for new nature based drugs which increase cardiac muscle contractility with a broad therapeutic index. The essential organ of the human body i.e. heart when fails to work leads to sudden death. Since the potent Cardiotonic drug i.e. the digoxin which is of the plant origin has a long list of ADR and toxicity, it is a need of hour to develop and standardize cardiotonic drugs of herbal origin [1, 2, 3, 4].

The coconut palm (*Cocos nucifera*) is a member of the family Arecaceae (palm family). It is the only accepted species in the genus Cocos. The term coconut can refer to the entire coconut palm, the seed, or the fruit, which, botanically, is a drupe, not a nut [5]. Found throughout the tropic and subtropic area where it is interwoven into the lives of the local people. In these regions, the palms were able to establish themselves on sandy and coralline coasts. It is particularly important in the low islands of the Pacific where, in the absence of land-based natural resources, It has been called the “tree of heaven” and “tree of life” as it provides almost all the necessities of life—food, drink, oil, medicine, fiber, timber, thatch, mats, fuel, and domestic utensils [6]. Coconuts are part of the daily diet of many people. Coconuts are different from any other fruits because they contain a large quantity of "water" and when immature they are known as tender-nuts or jelly-nuts and may be harvested for drinking [5]. Coconut water is the clear liquid inside young coconuts (fruits of the coconut palm). In early development, it serves as a suspension for the endosperm of the coconut during their nuclear phase of development. As growth continues the endosperm mature into their cellular phase and deposit into the rind of the coconut meat [7]. Characteristics of the water change as the coconut ages. A very young coconut (about 3–5 months, before the endosperm begins to form) has tasteless water that is somewhat astringent. Water from a mature coconut is slightly salty to the taste, although for coconuts grown well inland, the salty taste disappears. The best time to harvest a coconut for drinking is at age 6–7 months, just as the jelly-

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like endosperm begins to form. At this stage the water has maximum sweetness and low acidity. Nuts harvested at this age can be stored only 2–3 days before the water begins to sour [6]. Coconut water has long been a popular drink in the tropics, especially in India, Southeast Asia, Pacific Islands, Africa, and the Caribbean, where it is available fresh, canned, or bottled. In recent years, marketing claims attributing tremendous health benefits to coconut water as a natural energy or sports drink due to its high potassium and mineral content and very low amounts of fats, carbohydrates, calories, and sodium. In some developing countries, coconut water has been used as an intravenous hydration fluid where medical saline was unavailable [7]. Present study was undertaken to raise pharmacological significance of *cocos* with Cardiotonic activity based on chemical content on high potassium and antioxidants contents of coconut water.

EXPERIMENTAL WORKDONE

Material and Methods

Drug: Coconut water of *Cocos nucifera Palm.*

Chemical: Digoxin, Hypodynamic Ringer Solution, Distilled water

Animal: Frog

Instruments: Sherington Rotating Drum, Sterling's heart lever

Collection of Coconut Water [8-11]

The fresh fruits of coconut (*Cocos nucifera*) were collected from local market. The fruits were washed thoroughly to remove adhered material. Coconut water was removed into a clean & dry dish by making a hole into fruit followed by filtration with the help of filtration assembly. The filtered coconut water was diluted with the help of distilled water in the proportion 1:1 and labeled as follows.

T1-Undiluted Coconut Water

T2- Diluted Coconut Water (Coconut Water: Distilled Water, 1:1)

All the preparations were evaluated for their Cardiotonic activity by using Perfused frog heart assembly. The rate, cardiac output and force of heart contraction were determined.

Preparation of Reference Solution (Digoxin solution)

The marketed Digoxin ampoules were obtained from local market and diluted to get 25 µg/ml labeled as **S1**. Above prepared sample was evaluated for their cardiotonic activity and treated as standard.

Preparation of Hypodynamic Ringer Solution [12, 13]

Hypodynamic ringer solution was prepared by using standard method (Table no.1).

Evaluation of Cardiotonic activity [14-16]

The frog was pithed and pinned it to the frog board. A midline incision was given on the abdomen, the pectoral girdle was removed and the heart was exposed. The pericardium was carefully removed and put a few drops of hypodynamic frog ringer over the heart. The inferior venacava was traced, put a thread around it and given a small cut in order to insert the venous cannula. The cannula was inserted in the vein and the thread was tied to assure the cannula in place which is in turn connected to a saline bottle containing hypodynamic frog ringer solution. A small cut in one of the aorta was given for the ringer to come out. Heart was isolated and attached to the stand with moderate flow of ringer. A thin pin hook was passed through the tip of the ventricle and with the help of a fine thread attached to the hook; it was tied to the free limb of the Sterling's heart lever which was fixed to a stand. A proper tension was adjusted by altering the height of the lever. The normal heart rate was noted. All test samples that is T1, T2, and S1were administered in different doses viz. 0.1ml, 0.2ml, 0.3ml respectively. The rate and force of heart contraction were noted as given in (Table 2-4, Figure 1-3).

Table 1. Composition of Hypodynamic ringer solution

Sr.No.	Ingredients	Quantity
1.	Sodium chloride (NaCl)	6.5 gm
2	Potassium chloride (KCl)	0.14 gm
3	Calcium Chloride ($CaCl_2$)	0.03 gm
4	Sodium bicarbonate ($NaHCO_3$)	0.2 gm
5	Glucose	2 gm
6	Distilled Water	1000 ml

Table 2. Effects of Undiluted Coconut Water-T1 from *Cocos nucifera Palm* on isolated frog heart

Sr.No	Drug	Dose(ml)	Beats/min	Cardiac Output ml	Change In Force
1	-	Normal	42	5	Normal
2	T1	0.1 ml	0	3.8	No change
3	T1	0.2 ml	2	3.9	Slight increase
4	T1	0.3 ml	7	3.8	Slight increase

Table 3. Effects of Diluted Coconut Water (1:1)-T2 from *Cocos nucifera Palm* on isolated frog heart

Sr.No	Drug	Dose(ml)	Beats/min	Cardiac Output ml	Change In Force
1	-	Normal	70	5	Normal
2	T2	0.1	13	4.2	Slight increase
3	T2	0.2	16	4	Slight increase
4	T2	0.3	18	4	Slight increase

Table 4. Effects of Digoxin as a standard cardiotonic drug-S1 on isolated frog heart

Sr.No	Drug	Dose(ml)	Beats/min	Cardiac Output ml	Change In Force
1	-	Normal	78	10	Normal
2	S1	0.1	74	9.8	Slight increase
3	S1	0.2	76	10	Slight increase
4	S1	0.3	78	9.6	Slight increase

Fig. 1. Effects of Undiluted Coconut Water-T1 from *Cocos nucifera Palm* on isolated frog heart (0.1 ml, 0.2 ml, 0.3ml)

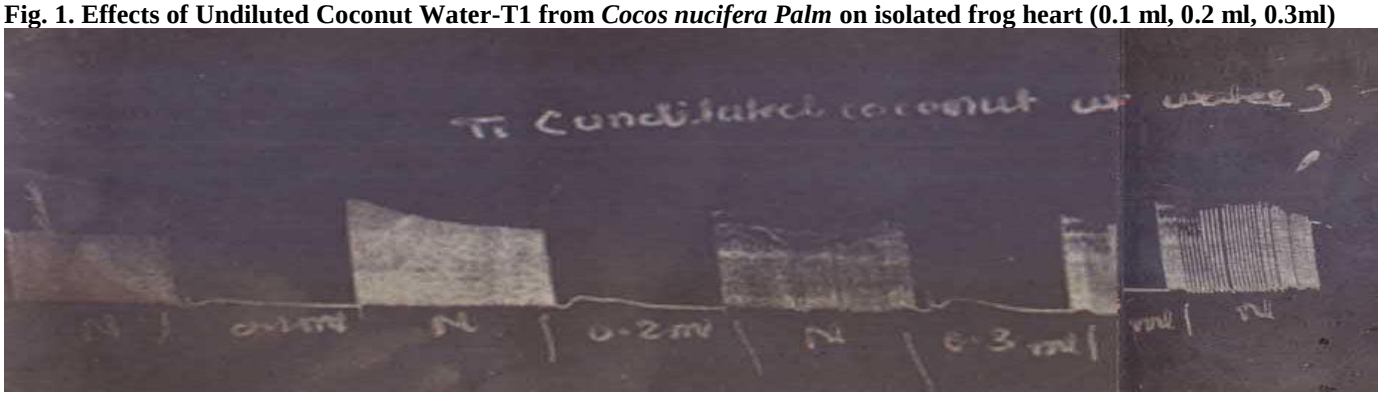


Fig.2. Effects of Diluted Coconut Water (1:1)-T2 from *Cocos nucifera Palm* on isolated frog heart (0.1 ml, 0.2 ml, 0.3ml)

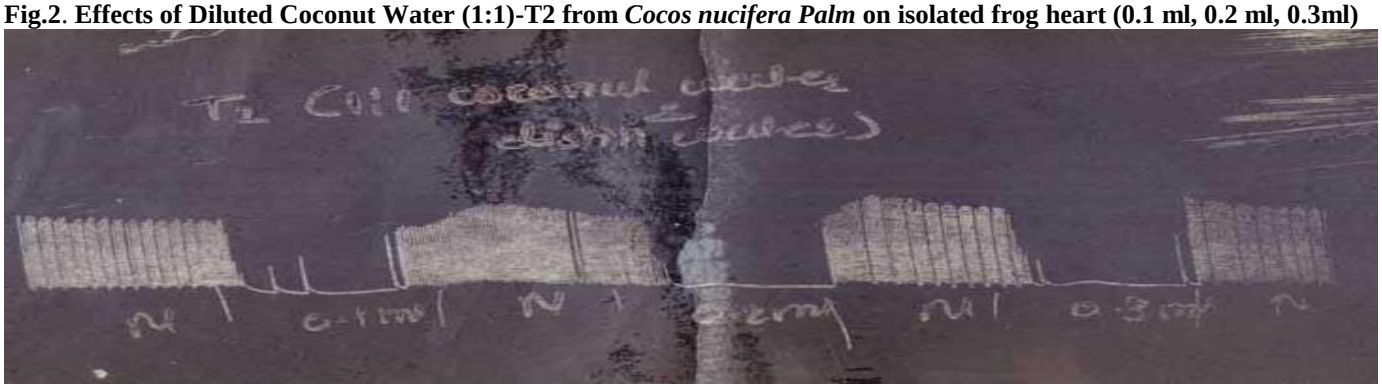
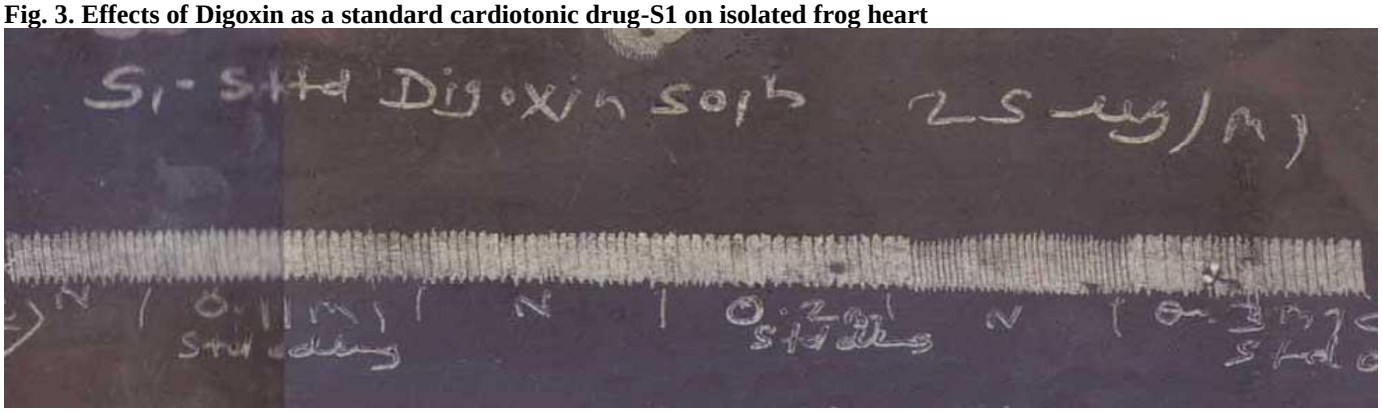


Fig. 3. Effects of Digoxin as a standard cardiotonic drug-S1 on isolated frog heart



RESULT AND DISCUSSION

The diluted coconut water (*Cocos nucifera*) restores cardiac activity on Frog's hearts i.e. it decreases rapidity and force of contraction. It was found that sample T1 (undiluted coconut water) showed healthier response as compared to T2 and S1. These preliminary studies confirmed the better cardiotonic activity of the coconut water (*Cocos nucifera*). It will be interesting to study the possible mechanism of action of coconut water by performing same experiment with isolated active constituent (*Cocos nucifera*). The observed pharmacological activities suggest that medicinal application of Cocos nucifera has a pharmacological basis.

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