



## PHYTOCHEMICALS SCREENING OF PHYSICO-CHEMICAL PARAMETERS AND FLUORESCENCE ANALYSIS OF PLANT ETHANOLIC LEAF EXTRACT *Costus pictus*

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### AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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### ABSTRACT

Drugs originating from plant sources are reflection to be a promising alternative for other synthetic anti-diabetics such as sulphonylureas, insulin treatment and biguanides. Plant products are believed to more preferable due to less toxicity, economic and better patient compliance. Hence, medicinal plants and products thereof are used in many countries in the treatment and management of diabetes. Vitamins are organic substances that are essential in minute amounts designed for the growth and activity of the body. They are obtained naturally on or after plant and animal foods. Organic in this definition refers in the direction of the chemistry with molecules. The word organic means that the molecules of substance contain the element carbon. The term also means that vitamins can be destroyed and become unable to perform their functions in our bodies. Every component plays an important role and deficiency of anyone constituent may lead to abnormal developments in the body. Plants are a rich source of all the elements essential for a human being. Qualitative analysis of various inorganic elements revealed the presence of calcium, magnesium, potassium, Iron, sulphates and phosphates. The present study of a good source of pharmacognostical and physicochemical parameters have pivotal roles in identification, authentication and establishment of quality parameters and vitamins of the species. Supplementation of this *Costus pictus* may be useful for human health associated emerging diseases such as diabetes, hypertension and cancer.

**Keywords:** Hyperglycemia; photochemistry; phytochemical; physico-chemical analysis; fluorescence.

### 1. INTRODUCTION

Diabetes mellitus can be described as a metabolic disorder of multiple etiologists characterized by chronic hyperglycemia by means of disturbances of carbohydrate, fat and protein metabolism due to

defects in insulin secretion, insulin action, or both [1]. Diabetes mellitus is a multidimensional disease known as a "syndrome." It is an endocrine and chronic metabolic disorder characterized by a chronic hyperglycemic state resulting from a malfunction of insulin secretion and/or insulin action caused by

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impaired regulation of carbohydrate, lipids and protein homeostasis [2]. 69% of adults in developing countries and 20% of developed countries are susceptible to diabetes [3]. With increased morbidity and mortality, diabetes mellitus is emerging as a major health problem [4-6]. According to in the direction of ancient Hindu physicians, 'Madhumeha' be a disease in which a patient pass sweet urine and exhibits sweetness all over the body. They had recorded in their observations that 'if too many ants swarm around a spot of urine, then the person has symptoms of diabetes mellitus [7]. The occurrence and consequences associated with diabetes are found to be high in countries like India (31.7%), China (20.8%) and United State of America (17.7%) [8]. The chronic hyperglycaemia of diabetes is connected with long-term damage, dysfunction and breakdown of various organs, especially the eyes, kidneys, nerves, heart and blood vessels. Symptoms of marked hyperglycemia include polyuria, polydipsia and weight loss, sometimes with polyphagia and blurred vision [9]. Injury of enlargement and susceptibility in the direction of certain infections can be accompanied by chronic hyperglycemia. Patients by means of diabetes contain an increased occurrence of atherosclerotic cardiovascular, peripheral arterial and cerebrovascular disease. Hypertension and abnormalities of lipoprotein metabolism are often found in people with diabetes [10]. The current studies in India indicate to around is an alarming rise in prevalence of diabetes which has gone beyond epidemic form to a pandemic one [11-12]. Globally, diabetes mellitus presents enormous with an increasingly important public health issue. Mortality and morbidity associated with diabetes are mainly due to complications arising from it which include neuropathy, nephropathy and retinopathy [13]. The human body possesses enzymatic and non-enzymatic anti-oxidative mechanisms which minimize the generation of reactive oxygen species, responsible for many degenerative diseases including diabetes [14]. Irrespective of the current phytochemistry and

pharmacological investigate, plough now no pharmacognostic work has been carried out resting on this species. The present investigation used different pharmacognostic and phytochemical parameters to supplement the identification and standardization information [15]. An important role in the management of diabetes mellitus especially in developing phytochemicals responsible for anti-diabetic effects of multiple therapeutic approaches of phytochemicals: Present status and future prospects.

## 2. MATERIALS AND METHODS

### 2.1 Collection, Identification and Authentication of Plant Species

The plant, *Costus pictus* were collected from the Saliyamangalam and Thanjavur district, Tamilnadu, India.

#### 2.1.1 Plant material

The leaf was dried under shade, mechanically reduced to a moderately coarse powder and stored in amber coloured airtight containers. Coarse form of the drug was employed for determination of physicochemical parameters like moisture content, ash values, swelling index, foaming index, foreign organic matter, extractive values, and qualitative fluorescence.

#### 2.1.2 Preliminary phytochemicals screening

Preliminary phytochemical screening was performed using standard procedures [16-18]. The extracts obtained from different solvents were subjected to identification tests for the detection of different phytoconstituents through organic and inorganic elements analysis, via the method of [16]. Fluorescence analysis of leaf powdered and various extracts was carried out by the standard method [19].



Fig. 1. Plant collection sites

### 2.1.3 Physico-chemical analysis

Air-dried leaf was used for the quantitative determination of ash values, extractive values, moisture content, swelling index, foaming index and foreign organic matter, via standard methods [18-21]. The total Ash value for a crude drug is not always reliable since there is a possibility of the presence of non-physiological substances such as earthy matters. So, the parameters such as acid-insoluble, water-soluble and sulphated ash values were performed. Extractive values with petroleum ether, chloroform, ethyl acetate, ethanol, methanol and water were also determined. The fluorescence analysis is a tool for the determination of constituents in the plant that gives a definite idea of the chemical nature.

## 3. RESULTS AND DISCUSSION

### 3.1 Preliminary Phytochemical Screening

The phytochemical report of the plant exposed the presence of alkaloids, carbohydrates, flavonoids, proteins, amino acids, phenols, tannins, glycosides and steroids as organic phyto-constituents.

Every constituent plays an important role and deficiency of anyone constituent may lead to abnormal developments in the body. Plants are a rich source of all the elements essential for a human being. Qualitative analysis of various inorganic elements revealed the presence of Calcium, Magnesium, Potassium, Iron, sulphates and phosphate.

### 3.2 Fluorescence Studies

The fluorescence analysis is a tool for the determination of constituents in the plant that gives a definite idea of the chemical nature [22]. Fluorescence analysis of the powdered drugs was performed and tabulated which helps to detect the adulteration because phytoconstituents exhibit characteristic fluorescence under ultraviolet light when they got mixed with the reagents [23]. The fluorescence exhibited by the mixture was attributed to the chemical constituents present in the crude drug. Prior to the phytochemical screening, a rough estimation of phytoconstituents was done by the behaviour of powder drug with different chemical reagents which powdered drug showed different colours when it gets varied the particular reagents which reflects the presence phytochemicals in accordance by means of the colours obtained. Fluorescence behaviour of *Costus pictus* leaf extract powder was represented.

### 3.3 Physico-chemical Analysis

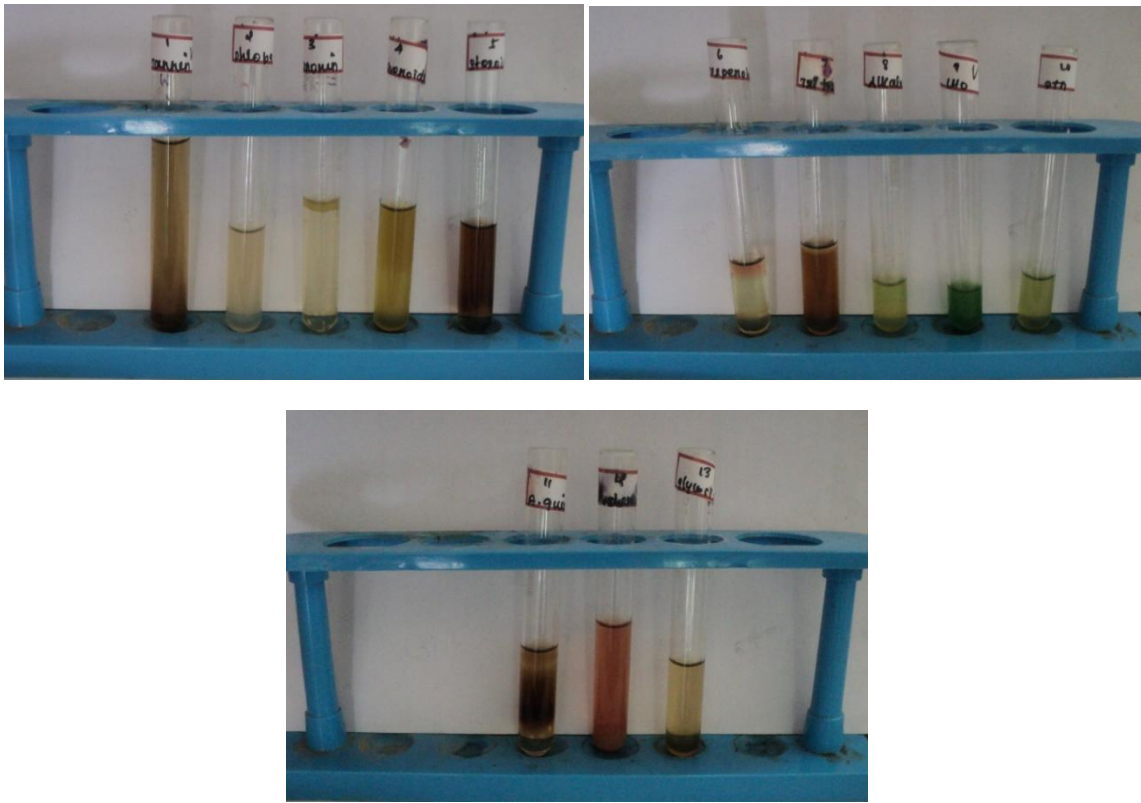
Drugs originating from plant sources are thought to be a promising alternative for other synthetic anti-diabetics such as sulphonylureas, insulin treatment and biguanides. Plant products are believed to more preferable due to less toxicity, economic and better patient compliance [24]. Hence, medicinal plants and products thereof are used in many countries in the treatment and management of diabetes. The results of physicochemical parameters such as total ash, acid insoluble ash, water-soluble ash and sulphated ash are

**Table 1. Qualitative analysis of phytochemicals analysis *C. pictus* leaf extract**

S. No	Analysed phytochemicals factor	Ethanol	Methanol	Water
1.	Tannin	++	+	+
2.	Phlobatannins	-	+	++
3.	Saponin	-	+	++
4.	Flavonoids	+++	++	-
5.	Steroids	++	-	+
6.	Terpenoids	+	+	-
7.	Triterpenoids	+	+	-
8.	Alkaloids	+++	++	+
9.	Carbohydrate	+	+	+
10.	Protein	++	-	++
11.	Anthraquinone	-	-	+
12.	Polyphenol	++	+	++
13.	Glycoside	+	-	-

Indications: "+" means positive activity, "-" means negative activity

Tannin, Phlobatannins, Saponin, Flavonoids, Steroids, Terpenoids, Triterpenoids, Alkaloids, Carbohydrate, Protein, Anthraquinone, Polyphenol and Glycoside



**Fig. 2. Qualitative phytochemical analysis of *Costus pictus* ethanolic solvent extracted powdered**

Indications: “+” means positive activity, “-” means negative activity  
 Tannin, Phlobatannins, Saponin, Flavonoids, Steroids, Terpenoids, Triterpenoids,  
 Alkaloids, Carbohydrate, Protein, Anthraquinone, Polyphenol and Glycoside.

**Table 2. Qualitative analysis of inorganic elements analysis of *C. pictus* in leaf extract**

S. No	Inorganic elements	Result
1.	Calcium	+
2.	Magnesium	+
3.	Sodium	-
4.	Potassium	++
5.	Iron	+++
6.	Sulphate	+
7.	Phosphate	+
8.	Chloride	-
9.	Nitrate	-

Indications: “+” means positive activity, “-” means negative activity

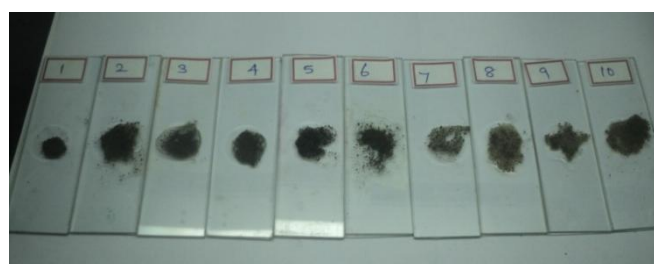
shown in Sulphated ash value (9.2%) was lower than the total Ash value (11.7%). The acid-insoluble and water-soluble ash values were 1.5% and 7.3%, respectively Further, the results also showed that moisture content, swelling index and foaming index were found to be 1.23%, 0.2 cm and less than 100 respectively while foreign organic content was found to be Nil. The extractive values for various solvents such as ethanol, methanol, water,

chloroform, ethyl acetate and, petroleum ether were found to be 11%, 7%, 4%, 2%, 1% and 5% respectively.

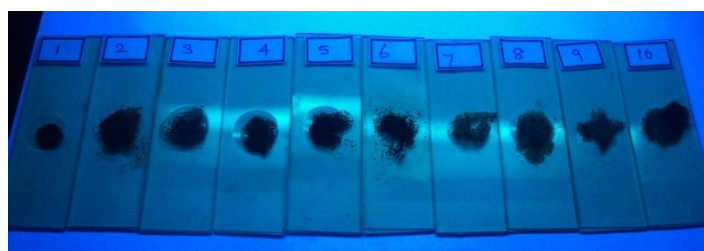
Medicinal plants are the main source of good quality source of pharmacognostical and physicochemical parameters have essential role in identification, and establishment of quality parameter of the species.

**Table 3. Fluorescence studies of *C. pictus* leaf extract**

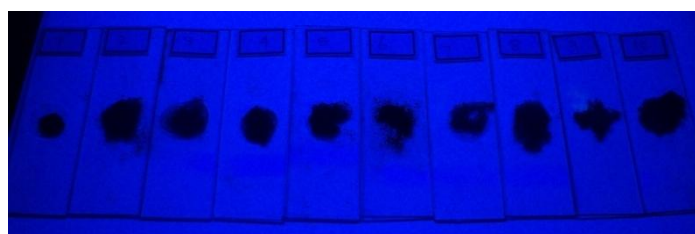
S. NO	Analysed phytochemical factor	Visible Light	Short UV 254nm	Long UV 365nm
1	Plant powder (pp)	Light Brown	Black	Dark Black
2	PP with water	Light Brown	Light Brown	Dark Brown
3	PP with Hexane	Light Brown	Dark Brown	Brown
4	PP with Chloroform	Light Brown	Creamish white	Yellow
5	PP with Methanol	Dark Brown	Yellow	Dark Black
6	PP with acetone	Brown	Dark Black	Brown
7	PP with IN Sodium hydroxide in water	Light Brown	Brownish -Yellow	Light Yellow
8	PP with IN Hydrochloric acid	Dark Brown	Off White	Light Brown
9	PP with sulphuric acid with an equal amount of water	Light Black	Dark Brown	Light Black
10	PP with Nitric acid diluted with an equal amount of water	Dark Yellow	Light Brown	Brown



**Visible Light**



**Short UV**



**Long UV**

**Fig. 3. Fluorescence studies of *C. pictus* leaf extract**

**Table 4. Ash values of *C. pictus* leaf extract**

S. No.	Parameters	Values
1	Total Ash	11.7%
2	Acid Insoluble Ash	1.5%
3	Water Soluble Ash	7.3%
4	Sulphated Ash	9.2%

**Table 5. Moisture content, foreign organic matter, foaming index and swelling index of *C. pictus* leaf extract**

S. No.	Parameters	Values
1	Moisture Content	1.23%
2	Foreign Organic Matter	Nil
3	Foaming Index	Less than 100
4	Swelling Index	0.2cm

**Table 6. Extractive values of *C. pictus* leaf extract**

S. No.	Solvent	Values % (w/w)
1	Ethanol	11
2	Methanol	7
3	Water	4
4	Chloroform	2
5	Ethyl Acetate	1
6	Petroleum Ether	5

#### 4. CONCLUSION

Phytochemical analysis of pivotal roles in identification, authentication, and establishment of quality parameters of the species is also important and pharmaceutical companies for the novel drugs for the treatment of various diseases. Supplementation of this *Costus pictus* may be useful for human health associated emerging diseases such as diabetes, hypertension and cancer. New effective bioactive drugs are in need, as plants do harbour and are proven to have potential anti-diabetic activity than the present hypoglycemic medicines used in clinical therapy. Minerals are inorganic substances that are found in all body tissues and fluids and existence necessary in order to maintain physicochemical processes that are essential to life. Therefore, more research is required to correlate its pharmacological activity with chemistry based evidences by strengthening linkage between researches being carried out by different groups across the world so that it can be developed as potential drugs.

#### CONSENT

It is not applicable.

#### ETHICAL APPROVAL

It is not applicable.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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