International Journal of Pharmacology and Pharmaceutical Technology

Volume 1 | Issue 2 Article 7

January 2017

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Recommended Citation

Sivapalan, Sri Ranjani (2017) "PHYSICO-CHEMICAL AND PHYTO-CHEMICAL STUDY OF RHIZOME of Cyperus rotundus LINN," *International Journal of Pharmacology and Pharmaceutical Technology*: Vol. 1 : Iss. 2 , Article 7.
DOI: 10.47893/IJPPT.2017.1022
Available at: https://www.interscience.in/ijppt/vol1/iss2/7

PHYSICO-CHEMICAL AND PHYTO-CHEMICAL STUDY OF RHIZOME of *Cyperus rotundus* LINN

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Abstract **-** *Cyperus rotundus* L., (Family Cyperaceae), also known as purple nutsedge or nutgrass, is a common perennial plant. This is a multipurpose plant, widely used in traditional medicine around the world to treat various diseases such as indigestion, constipation, dysentery, abdominal distention, neurogenic gastralgia, chest pains, irregular menstruation, painful menstruation, skin diseases, furuncle infections, leprosy, sprains and bruises, and fever. It has the property of therapeutic actions such as analgesic, alternative, astringent, antispasmodic, antibacterial, carminative, contraceptive, demulcent, emmenagogue, emollient, febrifuge, immunostimulant, laxative, tonic, vermifuge. Pharmacognostical investigations are the first and foremost step to determine the identity and to assess the quality of plant species. The aim of the study was to evaluate the parameter to determine the quality of the rhizome of *Cyperus rotundus* L. These studies comprise to investigate macroscopy, microscopy, physicochemical parameters, preliminary, phytochemical screening and fluorescence characteristics. The findings may provide useful information with regard to its identification and standardization in future.

Keywords: *Cyparus rotundus, nutgrass, purple nutsedge, physicochemical, phytochemical study*.

I. INTRODUCTION

Cyperus rotundus L., (family Cyperaceae), also known as purple nutsedge or nutgrass, is a common perennial plant. This is an erect, glabrous, grass-like herb with fibrous roots that typically grows from 7-40 cm tall and reproduces extensively by rhizomes and tubers. The rhizomes are initially white and fleshy with scaly leaves and then become fibrous, wiry, and very dark brown with age. *C. rotundus* is reportedly native to India, but it has been introduced around the World[1-3]. The plant is found growing abundantly throughout Sri Lanka especially in the tropical areas. It grows under a variety of soil conditions being common in waste lands, gardens open areas etc. but usually prefers a moist somewhat sandy soil. *C. rotundus* has been used in traditional medicine for various ailments.

C. rotundus have the Properties of analgesic, alternative, astringent, antispasmodic, antibacterial, carminative, contraceptive, demulcent, emmenagogue, emollient, febrifuge, immunostimulant, laxative, stimulative, tonic, vermifuge. It is a multipurpose plant, widely used in traditional medicine around the world to treat various diseases[4,-6].

Wills stated that extracts and compounds isolated from purple nutsedge have medicinal properties such as the reduction of fever, inflammation, and pain. The literature contains numerous references to the use of this plant's roots for essential oils and its seeds for food products. Tuber extracts may reduce nausea and act as a muscle relaxant[7]. A number of pharmacological and biological activities including anti-*Candida*, anti-inflammatory, antidiabetic, antidiarrhoeal, cytoprotective, antimutagenic, antibacterial, and antioxidant, activities have been reported for this plant[8-13]. The phytochemical investigation of *C rotundus* has revealed the presence of flavanol, glycoside, saponin, phenol, terpenoids cardiac glycosides[14].

II. MATERIALS AND METHODS

The plant *C. rotundus* belonging to family Cyperaceae are widely found growing abundantly throughout Sri Lanka especially in tropical regions. The rhizomes of *C. rotundus* were collected from Kaithady, Unit of Siddha Medicine, University of Jaffna in the month of June 2011. The plant was identified by observing the morphological characters reference to the text Indian medicinal plants by Kirthikar and Basu[15]. Botanical identification was confirmed by a botanist, Department of botany, University of Jaffna, Sri Lanka. Fresh healthy rhizomes were used to study the microscopic, and macroscopic analysis. The shade dried rhizomes were cut it into small pieces and made into

powdered using mechanical grinder and sieved up to 60/80 meshes and preserved in air tight container for further analysis. The powders of the rhizome were used for physicochemical determination and phytochemical screening.

MACROSCOPY

ORGANOLEPTIC CHARACTERS

Fresh rhizome of *C. rotundus* L was studied for organoleptic characters such as appearance, colour, odour, and taste[16].

MICROSCOPY

PREPARATION OF SPECIMENS[17]

The healthy rhizome was cut and removed from the plant and fixed in FAA (formalin - 5ml + acetic acid - 5ml + 70% ethyl alcohol - 90ml). After 24 hrs of fixing, the specimens were dehydrated as per schedule. Infiltration of the specimens was carried by gradual addition of paraffin wax (melting point 58-60°C) until tertiary-butyl alcohol solution attained super saturation. The specimens were cast into paraffin blocks. The paraffin embedded specimens were sectioned with the help of Rotary Microtome[18]. Dewaxing of the sections was carried out by standard procedure and stained the method published by O'Brien *et al.*,[19]. The photographs were taken through the microscope.

PHYSICO-CHEMICAL ANALYSIS

Loss on drying, Crude fiber content, Total ash, Acid insoluble ash, Water soluble ash, Sulphated ash Water soluble extractive, Alcohol soluble extractive values were calculated as per Indian pharmacopoeia[20]. Successive extractive values were observed with solvents of petroleum ether ($60\text{-}80^0$c), n-hexane, acetone, Alcohol, Aqueous[21,22].

FLUORESCENCE ANALYSIS

The petroleum ether, n-hexane, acetone, alcohol and aqueous extracts and the powder samples of rhizomes of *C. rotundus* Linn. was subjected to fluorescence analysis as per Chase and Pratt[23.]

PHYTOCHEMICAL STUDIES

PHYTOCHEMICAL SCREENING

The extracts prepared for the study were subjected to preliminary phytochemical screening by using different reagents for identifying the presence of various phytoconstituents like steroids, phenolic compounds, flavonoids, glycosides, saponins, triterpenoids, alkaloids, anthroquinones, tannins, quinines coumarins and reducing sugars. The above phytoconstituents were tested as per the standard methods[24,25] .

III. RESULTS AND DISCUSSION

The results of morphological, microscopical, physicochemical, and phytochemical, studies *C. rotundus* L are presented here.

The **Cyperus rotundus** is slender, erect, perennial sedge which spreads by means of a fibrous root system. Its slender, underground stems, known as rhizomes are initially white, fleshy and covered with scaly, modified leaves, but become brown and woody with age. Rhizomes are elongated trigonous shape measure around 1 to 3.5 centimeters in length (Fig 1).

Oganoleptic characters of *Cyperus rotundus* rhizome were shown in Table 1. The characteristic of powder are coarse, brown, with pleasant odour and slightly bitter and astringent.

Microscopic features in sectional view, the rhizome showed thin, continuous, superficial periderm. The periderm is fissured at several places. There is a thin cortex where the cells have compressed into narrow compact dark tissue. The central part of the rhizome has fan shaped segments of xylem, the narrow ends of the segments facing the center. The major part of the *C. rotundus* L. rhizome consists of vascular tissues and the central xylem, thin walled xylem fibers. The xylem parenchyma which forms the major ground tissue of the root contains dense starch grains. The starch grains are simple, circular with central hilum (Fig 2).

Physicochemical parameters such as Loss on drying, Crude fiber content were shown in Table 2, Total ash, Acid insoluble ash, Water soluble ash, Sulphated ash are shown in Table 3. Ash value used to determine quality and purity of crude drug. The extractive values are useful to evaluate the chemical constituents present in crude drug and also help in estimation of specific constituents soluble in particular solvent.

The results of extractive values are shown in Table 4. Higher extractive value of alcohol extract is due to presence of Phenolic compounds, flavonoids, glycosides, saponins**,** alkaloids, and tannins. The preliminary phytochemical screening of different extracts of rhizome of *C. rotundus* Linn. showed the presence of phenolic compounds, flavonoids, alkaloids and absence of triterpenoids, anthroquinones and coumarins in all the extracts. Steroids were present in petroleum ether and n-hexane extracts, reducing sugars and glycosides were present in acetone, alcoholic and aqueous extracts, saponins and tannins were present in alcoholic and aqueous extracts. The results of fluorescent characters of various extracts of C. *rotundus* rhizome gave distinct colour difference in day and UV light. It is shown in Table 5.The findings of preliminary phytochemical screening was helpful to identify the

nature of herbs and also useful to detect of different constituents present in different polarity solvent.

Since herbal medicines are from materials of organic origin they are prone to contamination, deterioration and variation in composition. This gives rise to inferior quality of herbal products with little or no therapeutic efficacy. Most often the desired biological response is due to not one but a mixture of bio active constituents and the relative proportion of active constituents can vary from plant to plant of the same species and also in different parts of the plant. Hence quality control of the plant's raw materials is the most important challenge in bringing any of the traditional medicine for phytomedicines to the acceptance of concerned people. And hence this detailed pharmacognostical study had provided authentication procedures and the phytochemical characteristics of *C. rotundus* rhizome.

IV. CONCLUSION

All studied standardization parameters such as macroscopy, microscopy, physicochemical parameters, and phytochemical screening was carried out and it could provide the knowledge in authentication of *C. rotundus* rhizome. Phytochemical screening results will be helpful to find out the genuine drug. Physicochemical parameters such as Loss on drying, Crude fiber content, Total ash, Acid insoluble ash, Water soluble ash, Sulphated ash and Successive extractive values were observed with solvents of petroleum ether n-hexane, acetone, Alcohol, Aqueous. These values can be useful to detect adulteration.

Table 1: Organoleptic characteristics of *Cyperus rotundus* Linn Rhizome

Serial No:	**Organoleptic Parameters**	***Cyperus rotundus* Linn Rhizome**
1	Appearance	Coarse powder
2	Colour	Brown
3	Odour	Pleasant odour
4	Taste	Slightly bitter & astringent

Table 2: Physicochemical parameters of *Cyperus rotundus* Linn Rhizome

Parameters	***Cyperus rotundus* Linn Rhizome**
Loss on drying, %	3.57
Crude fiber content %	39.98

Table 3: Physicochemical parameters of *Cyperus rotundus* Linn Rhizome- Ash values

Serial No	**Parameters**	***Cyperus rotundus* Linn Rhizom(%w/w)**
1	Total ash	12.87
2	Acid insoluble ash	4.56
3	Water soluble ash	6.4
4	Sulphated ash	10.22

Table 4: Extractive values of *Cyperus rotundus* Linn Rhizome

Serial No	**Parameters**	***Cyperus rotundus* Linn Rhizome (%w/w)**
1	Water soluble extract	15.15
2	Alcohol soluble extract	21.27
	Successive extraction	
3	Petroleum ether (60 –80°C)	1.27
4	n-hexane	1.79
5	Acetone	1.82
6	Alcohol (90%)	1.78
7	Aqueous	1.47

Table 5: Fluorescence analysis of *Cyperus rotundus* Linn Rhizome

Preparation	**Day Light**	**UV Light**
Extracts Petroleum ether	Pale brown	Dark Brown
n-hexane	Yellow	Yellowish green
Acetone	Brown	Brown
Alcohol	Yellow	Green
Aqueous	Light brown	Brown

Table 6: Phytochemical screening of *Cyperus rotundus* L. rhizome

S. No.	**Chemical test**	**Petroleum ether**	**n-hexane**	**Acetone**	**Alcohol**	**Aqueous**
1	Phenolic compounds	+	+	+	+	+
2	Steroids	+	+	+	-	-
3	Flavonoids	+	+	+	+	+
4	Glycosides	-	-	+	+	+
5	Saponins	-	-	-	+	+
6	Triterpenoids	-	-	-	-	-

7	Alkaloids	-	-	+	+	+
8	Anthroquinones	-	-	-	-	-
9	Tannins	-	-	-	+	+
10	Coumarins	-	-	-	-	-
11	Reducing sugars	-	-	+	+	+

+ indicates presence, - indicates absence

Figure 1: *Cyperus rotundus* Linn rhizomes

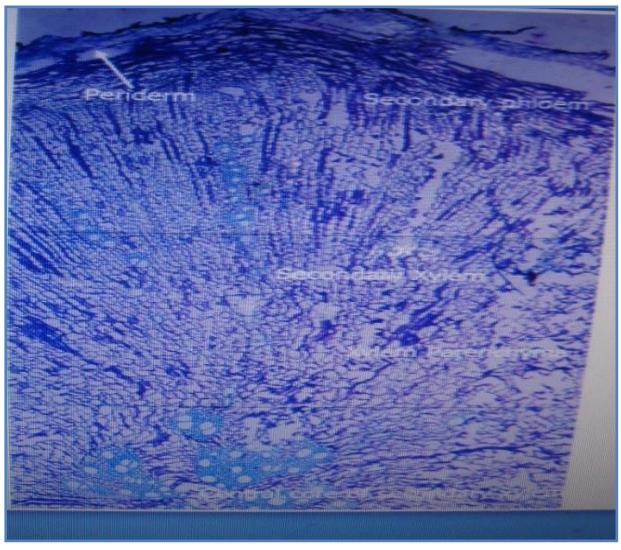

Figure 2: Transverse Section of *Cyperus rotundus* Linn Rhizome

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