

## Review on *Cyperus rotundus* - A Potential Herb

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### ABSTRACT

Ayurveda, the science of life, deals with the holistic view of healthy living. It covers various physiology and pathology of diseases and their therapies. Since ancient times, several diseases have been treated by administration of plant extracts based on traditional medicine. Investigation of traditionally used medicinal plants is thus valuable on two levels, firstly, as a source of potential chemotherapeutic drugs, and secondly, as a measure of safety for the continued use of medicinal plants. The rhizomes of *Cyperus rotundus* which are used as traditional folk medicines for the treatment of stomach, bowel disorders and inflammatory diseases. *Cyperus rotundus* contains essential oils, terpenes, flavonoids, b-sitosterol, and ascorbic acid. The main terpenes in *Cyperus rotundus* are cyperenes, which include sesquiterpene hydrocarbons. This paper explains the evidence-based information regarding the pharmacological activity of this plant. It has many ethnobotanical uses and is medicinally used in the traditional Ayurvedic system.

**Keywords:** Ayurveda, Pharmacological action, Phytochemistry, *Cyperus rotundus*.

### INTRODUCTION

The genus *Cyperus* includes common weeds found in upland and paddy fields in temperate to tropical regions. In Asian countries, the rhizomes of *Cyperus rotundus*, which are used as traditional folk medicines for the treatment of stomach and bowel disorders, and inflammatory diseases, have been widely investigated.<sup>[1-4]</sup>

*Cyperus rotundus* (*Cyperaceae*) is a traditional herbal medicine used widely as analgesic, sedative, antispasmodic, antimalarial, stomach disorders and to relieve diarrhea.<sup>[5]</sup> The tuber part of *C. rotundus* is one of the oldest known medicinal plants used for the treatment of dysmenorrhea and menstrual irregularities.<sup>[6]</sup> Infusion of this herb has been used in pain, fever, diarrhea, dysentery, an emmenagogue and other intestinal problems.<sup>[7-9]</sup>

### PHYTOCHEMISTRY

Phytochemical studies have shown that the major chemical components of this herb are essential oils, flavonoids, terpenoids, mono- and sesquiterpenes.<sup>[10-11]</sup>

The plant contains the following chemical constituents- Cyprotene (1), cypera-2, 4-diene (2), a-copaene (3), cyperene (4), aselinene (5), rotundene (6), valencene (7), ylanga-2, 4-diene (8), g-gurjunene (9), trans-calamenene (10), d-cadinene

(11), g-calacorene (12), epi-a-selinene (13), a-murolene (14), g-murolene (15), cadalene (16), nootkatene (17) by comparison with a spectral library established under identical experimental conditions<sup>[12]</sup>, cyperotundone (18)<sup>[13]</sup>, mustakone (19), cyperol (20)<sup>[14]</sup>, isocyperol (21)<sup>[15]</sup> and a-cyperone (22).<sup>[16-17]</sup>

### BIOLOGICAL ACTIVITY

#### ANTIMUTAGENS AND RADICAL SCAVENGERS

This study evaluates mutagenic and antimutagenic effects of aqueous, total oligomers flavonoids (TOF), ethyl acetate and methanol extracts from aerial parts of *Cyperus rotundus* with the *Salmonella typhimurium* assay system. The different extracts showed no mutagenicity when tested with *Salmonella typhimurium* strains TA98, TA100, TA1535 and TA1538 either with or without the S9 mix. On the other hand, our results showed that all extracts have antimutagenic activity against Aflatoxin B1 (AFB1) in TA100 and TA98 assay system, and against sodium azide in TA100 and TA1535 assay system. TOF, ethyl acetate and methanol extracts exhibited the highest inhibition level of the Ames response induced by the indirect mutagen AFB1. Whereas, ethyl acetate and methanol extracts exhibited the highest level of protection towards the direct mutagen, sodium azide, induced response. In addition to antimutagenic activity, these extracts showed an important free radical scavenging activity towards the 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical. TOF, ethyl acetate and methanol extracts showed IC50 value of 15, 14 and 20 g/ml, respectively.<sup>[18]</sup>

#### ANTIMALARIAL

Activity-guided investigation of *Cyperus rotundus* tubers led to the isolation of patchoulone, caryophyllene oxide, 10,

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12-peroxycalamenene and 4, 7-dimethyl-1-tetralone. The antimalarial activities of these compounds are in the range of EC<sub>50</sub> 10<sup>-4</sup>-10<sup>-6</sup> M, with the novel ndoperoxide sesquiterpene, 10, 12-peroxycalamenene, exhibiting the strongest effect at EC<sub>50</sub> 2.33 × 10<sup>-6</sup> M.<sup>[19]</sup>

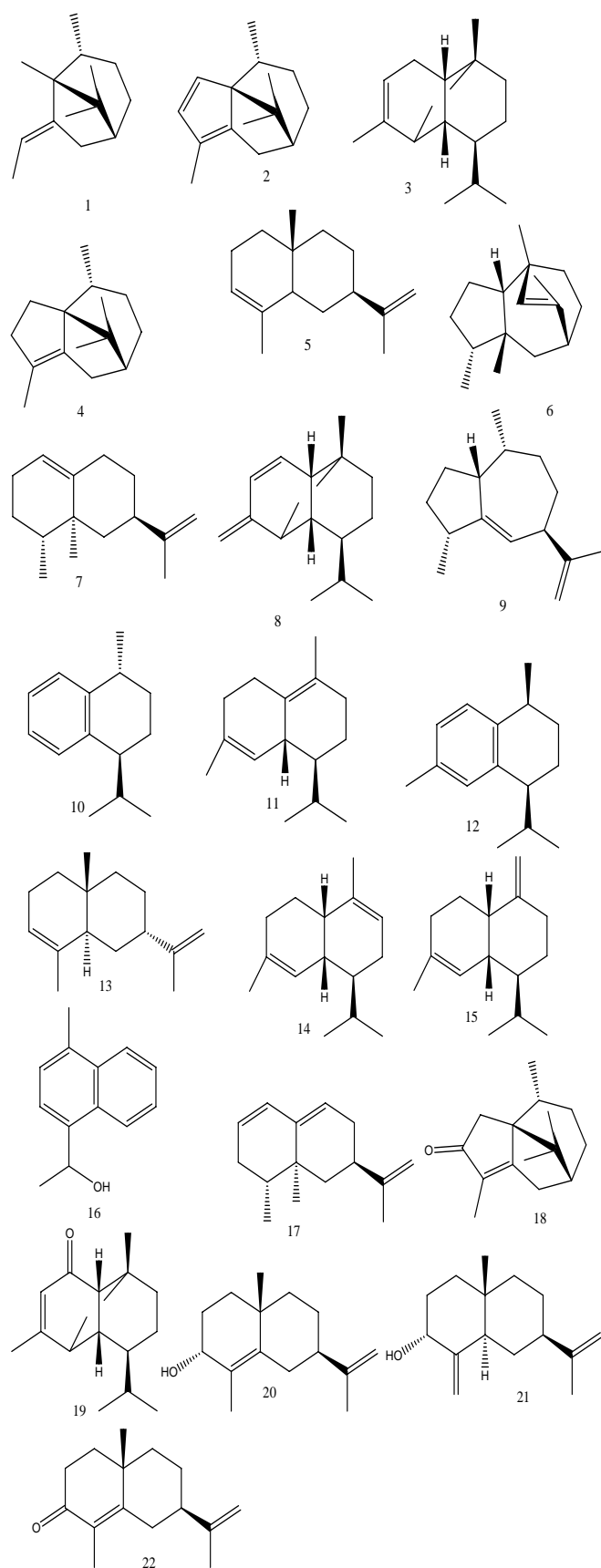


Fig. 1: Structure of chemical constituents

### ANTIDIARRHOEAL

The methanol extract of *Cyperus rotundus* rhizome, given orally at the doses of 250 and 500 mg/kg b.w., showed significant antidiarrhoeal activity in castor oil induced diarrhoea in mice. Among the fractions, tested at 250 mg/kg, the petroleum ether fraction (PEF) and residual methanol fraction (RMF) were found to retain the activity, the latter being more active as compared to the control. The ethyl acetate fraction (EAF) did not show any antidiarrhoeal activity.<sup>[20]</sup>

### ANTIDIABETIC ACTIVITY

In light of the traditional claim of *Cyperus rotundus* in the treatment of diabetes, investigations were carried out to evaluate its effect on alloxan induced hyperglycemia in rats. Oral daily administration of 500 mg/kg of the extract (once a day for seven consecutive days) significantly lowered the blood glucose levels. This antihyperglycemic activity can be attributed to its antioxidant activity as it showed the strong DPPH radical scavenging action *in vitro*.<sup>[21]</sup>

### ANTIBACTERIAL ACTIVITY

*Cyperus rotundus* has many different uses and these were based on the different parts of plant. The medical uses of cyperus have been used in medicine for thousands of years. The parts of the cyperus used are its leaves, seeds and oil. The Extraction process was carried out by steam distillation. Optimum organic extractant determined. The collected oil was identified via Thin Layer Chromatography (TLC) using a mixture of ethylacetate: toluene (1:9) as chromatographic eluent. This study was designed to extract and identify of essential cyperus oil from *Cyperus rotundus*. The Antibacterial activity of Cyperus oil was studied for various microorganisms (*Staphylococcus aureus*, *Klebsiella pneumoniae*, *Proteus vulgaris*, *Streptococcus pyogenes*, *Escherichia coli* and *Pseudomonas aeruginosa*) using inhibition zone method (Aromatogram). The MIC and MBC for each microbe were estimated. The oil of *C. rotundus* was shown a remarkable activity against gram-positive bacteria, less antibacterial activity was found against gram-negative bacteria and no activity was observed with the oil against *Pseudomonas aeruginosa* and *Proteus vulgaris*. Novel method for extraction and identification of chemical composition for Iraqi Cyperus oil was conducted. The study of the biological activities of this oil is very important because of needing to be determined whether there is any correlation between the biological activities and one or more of the chemical compounds purified from *Cyperus rotundus* oil.<sup>[22]</sup>

### ANTIOXIDANT ACTIVITY

Antioxidant activity of *Cyperus rotundus* rhizomes extract (CRRE) was evaluated in a series of *in vitro* assay involving free radicals and reactive oxygen species and IC<sub>50</sub> values were determined. CRRE exhibited its scavenging effect in concentration dependent manner on superoxide anion radicals, hydroxyl radicals, nitric oxide radical, hydrogen peroxide, and property of metal chelating and reducing power. The extract was also studied for lipid peroxidation assay by thiobarbituric acid-reactive substances (TBARS) using young and aged rat brain mitochondria. The extract was also effective in preventing mitochondrial lipid peroxidation induced by FeSO<sub>4</sub> ascorbate in concentration dependent manner. The results obtained in the present study indicate that *C. rotundus* rhizomes extract can be a potential source of natural antioxidant.<sup>[23]</sup>

**OVICIDAL AND LARVICIDAL ACTIVITIES**

The ovicidal and larvicidal efficacy of essential oils extracted from the tubers of *Cyperus giganteus* and *Cyperus rotundus* Linn. was studied on eggs and fourth instar larvae of *Aedes albopictus*. The eggs and larvae were exposed to serial concentration of the oils ranging from 5-150 ppm and kept under observation for 24 h. Both the oils showed remarkable ovicidal and larvicidal activities indicated by EC50 values of <5 ppm and LC50 and LC90 values of <20 ppm. The results obtained suggest that the essential oils of these *Cyperus* species can serve as a potential source of natural mosquitocidal agents.<sup>[24]</sup>

**WOUND HEALING ACTIVITY**

To evaluate the wound healing activity of extract of tuber parts of *Cyperus rotundus*. It is a well-known plant in Indian traditional medicine. On the basis of traditional use and literature references, this plant was selected for evaluation of wound healing potential. An alcoholic extract of tuber parts of *Cyperus rotundus* was examined for wound healing activity in the form of ointment in three types of wound models on rats: the excision, the incision and dead space wound model. The extract ointments showed considerable difference in response in all the above said wound models as comparable to those of a standard drug nitrofurazone ointment (0.2 % w/w NFZ) in terms of wound contracting ability, wound closure time and tensile strength.<sup>[25]</sup>

**CONCLUSION**

The above collected information regarding the use of *Cyperus rotundus* in world is matched with available literature. Recent years, ethno-botanical and traditional uses of natural compounds, especially of plant origin received much attention as they are well tested for their efficacy and generally believed to be safe for human use. It is best classical approach in the search of new molecules for management of various diseases. Thorough screening of literature available on *Cyperus rotundus* depicted the fact that it is a popular remedy among the various ethnic groups, Ayurvedic and traditional practitioners for treatment of ailments. Researchers are exploring the therapeutic potential of this plant as it has more therapeutic properties which are not known.

**REFERENCE**

1. Gupta MB, Palit TK, Singh N, Bhargava KP. Pharmacological studies to isolate the active constituents from *Cyperus rotundus* possessing anti-inflammatory, anti-pyretic and analgesic activities. Indian Journal of Medical Research 1971; 59: 76–82.
2. Singh N, Kulshrestha VK, Gupta MB, Bhargava KP. A pharmacological study of *Cyperus rotundus*. Indian Journal of Medical Research 1970; 58: 103–109.
3. Weenen H, Nkunya MH, Bray DH, Mwasumbi LB, Kinabo LS, Kilimali VA. Antimalarial activity of Tanzanian medicinal plants. Planta Medica 1990a; 56: 368–370.
4. Thebtaranonth C, Thebtaranonth Y, Wanauppathamkul S, Yuthavong Y. Antimalarial sesquiterpenes from tubers of *Cyperus rotundus*: structure of 10,12-peroxycalamenene, a sesquiterpene endoperoxide. Phytochemistry 1995; 40: 125–128.
5. Zhu M, Luk HH, Fung HS, Luk CT. Cytoprotective effects of *Cyperus rotundus* against ethanol induced gastric ulceration in rats. Phytother. Res 1997; 11: 392–394.
6. Bhattarai NK. Folk herbal remedies for diarrhoea and dysentery in central Nepal. Fitoterapia 1993; 64: 243–250.
7. Uddin SJ, Mondal K, Shilpi JA, Rahman MT. Antidiarrhoeal activity of *Cyperus rotundus*. Fitoterapia 2006; 77 (2): 134–136.

8. Vidal J. Les. plantes utiles du Laos: Cryptogames-Gymnospermes-Monocotylédones. Journal d'Agriculture tropicale et de Botanique appliquée 1963; 320–325.
9. Umerie SC, Ezeuzo HO. Physicochemical characterization and utilization of *Cyperus rotundus* starch. Bioresour. Technol 2000; 72: 193–196.
10. Ohira S, Hasegawa T, Hyashi KI, Hoshino T, Takaoka D, Nozaki H. Sesquiterpenoids from *Cyperus rotundus*. Phytochemistry 1998; 47: 1577–1581.
11. Kilani S, Abdelwahed A, Chraief I, Ben Ammar R, Hayder N, Hammami M, Ghedira K, Chekir-Ghedira L. Chemical composition, antibacterial and antimutagenic activities of essential oil from (Tunisian) *Cyperus rotundus*. J. Essent. Oil Res 2005a; 17: 695–700.
12. Joulain D, König WA. The Atlas of Spectral Data of Sesquiterpene Hydrocarbons. E. B.-Verlag, Hamburg 1998.
13. Hikino H, Ito K, Aota K. Structure and absolute configuration of cyperotundone. Chemical and Pharmaceutical Bulletin 1966; 14: 890–899.
14. Nyasse B, Ghogumu Tih R, Sodengam BL, Martin MT, Bodo B. Mandassidione and other sesquiterpenic ketones from *Cyperus articulatus*. Phytochemistry 1988; 27: 3319–3321.
15. Hikino H, Takemoto T. Structure and absolute configuration of cyperol and isocyperol. Chemical and Pharmaceutical Bulletin 1967; 1929–1933.
16. Howe R, Mc Quillin FJ. The structure of cyperone. Part IV. The synthesis of natural (+)-a-cyperone, its enantiomorph and epimer. Journal of the Chemical Society 1955; 2423–2428.
17. Haaksma AA, Jansen BJM, de Groot A. Lewis acid catalysed Diels-Alder reactions of S-(+)-carvone with silyloxy dienes. Total synthesis of (+)-a-cyperone. Tetrahedron 1992; 48: 3121–3130.
18. Kilani Soumaya, Ben Ammara Ribai, Bouhle Ines. Investigation of extracts from (Tunisian) *Cyperus rotundus* as antimutagens and radical scavengers. Environmental Toxicology and Pharmacology 2005; 20: 478–484.
19. Thebtaranonth C, Thebtaranonth Y. Antimalarial sesquiterpenes from tubers of *cyperus rotundus*: structure of 10,12-peroxycalamenene, a sesquiterpene endoperoxide, *Phytochemistry* 1995; 40(1): 125–128.
20. Uddin SJ, Mondal K, Shilpi JA, Rahman MT. Antidiarrhoeal activity of *Cyperus rotundus*. Fitoterapia 2006; 77: 134–136.
21. Raut Nishikant A, Gaikwad Naresh J. Antidiabetic activity of hydro-ethanolic extract of *Cyperus rotundus* in alloxan induced diabetes in rats. Fitoterapia 2006; 77: 585–588.
22. Majid Nima Zeid Abdul, Jabier Majid Sakhi Jabier, Wagi Raghidah Ismaeel, Kareem Hussain Huda Abd Al. Extraction, Identification and Antibacterial activity of *Cyperus* oil from Iraqi *C. rotundus*. Eng. & Technology 2008; 26: 10.
23. Nagulendran kr, Velavan S, Mahesh R. *In Vitro* Antioxidant Activity and Total Polyphenolic Content of *Cyperus rotundus* Rhizomes, E-Journal of Chemistry 2007; 4(3): p 440–449.
24. KemprajVivek, Bhat Sumangala K. Ovicidal and larvicidal activities of *Cyperus giganteus* Vahl and *Cyperus rotundus* Linn. essential oils against *Aedes albopictus* (Skuse), Natural Product Radiance 2008; 7(5): 416–419.
25. Puratchikody A, Devi Nithya C, Nagalakshmi G. Wound healing activity of *Cyperus rotundus* linn. Indian journal of pharmaceutical sciences 2006; 68: 97–101.