PHARMACOLOGICAL ACTIVITY AND PHYTOCHEMISTRY OF *CYPERUS ROTUNDUS* L.

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ABSTRACT

Cyperusrotundas L. belonging to Family Cyperaceaehas been used for a variety of medicinal purposes throughout history developing naturally in temperate, subtropical, and tropical environments. According to Ayurveda, the rhizomes of C. rotundas have been used traditionally to treat a variety of ailments, including stomach and intestinal disorders, as well as for antidiabetic, antimalarial, antidiarrheal, anti-inflammatory, antipyretic, and analgesic reasons. This review study assesses the pharmacognostic, phytochemical and physicochemical characteristics of the C. rotundus rhizome in addition to the many medicinal uses. Later, these characteristics may be used to easily identify C. rotundus grass, particularly in the case of powdered material, and they might even be able to tell the drugs apart from other species.

Keywords: *Pharmacogonistic , phytochemistry, Cyperus rotundus, antidiarrheal*

Introduction

The needs of primary healthcare have been satisfied by plant-based medical systems since thousands of years ago. Ancient cultures made considerable use of plant resources in their healing procedures. Particularly in developing and underdeveloped countries, more than 80% of the world's population still relies on plant resources. It is significant to highlight that the majority of modern medications are derived from plants, supporting many claims made regarding their efficacy. Due to the fact that they are made from plants, herbal therapies are considered to be secure (Mohd et al., 2021; Goli et al., 2021).

Numerous local and indigenous people in emerging Asian countries still source their basic needs from the medicinal plant products they make for a living based on their long-held knowledge and expertise.Most rural and tribal residents, many of whom reside in completely remote areas, are somewhat dependent on forest products, especially therapeutic herbs. The ethnomedicines made from the medicinal plants are believed to be more secure, and they have proven successful in treating a range of illnesses (Ansari et al., 2019; Mehrotra, 2020; Malik et al., 2020). A member of the Cyperaceae family, Cyperus rotundus L. is also known as nut grass in English, motha in Hindi, and nagarmotha in Marathi. There are

numerous health benefits that *C. rotundus* demonstrates.

The genus Cyperus contains common weeds that thrive in highland regions and rice paddies in temperate to tropical temperatures. *C.rotundus* rhizomes are used in conventional folk medicine in Asian countries (Singh et.al,2016).The pharmacological profile of *C. rotundus* includes antidiabetic, antidiarrheal, anti-inflammatory, antipyretic, anti-ulcer, antimalarial, carminative, astringent, alleviate pain, aphrodisiac, anthelmintic, diuretic, antioxidant, analgesic, and for the treatment of stomach and bowel diseases (Jaysweera, 1980; Mansoore etal., 2014; Sivapalan, 2018; Taheri et al., 2021). Long rhizomes, six linear-shaped, dark green leaves, and little flowers can be found on the herb *C. rotundus* (Stone, 1970). 2-4 bracts and a few thin stems make up the inflorescence. The nut is strongly triangular in shape, oblong in shape, and becomes yellow to black when fully grown. It is approximately half as tall as that of the glumes (Rose, 2003). Microscopic and FTIR spectroscopic analyses have also been performed on the powder of the dried rhizome of *C. rotundus*.

Numerous phytochemical analyses of *C. rotundus* show the presence of numerous chemical compounds, including glycerol, myristic, furochromones, stearic acids, and linolenic, as well as alkaloids, glycosides, flavonoids, starch, tannins, sitosterol, mono

and sesquiterpenes, and fatty oils containing an unidentified neutral waxy substance (Dutta et al., 1950). The plant thrives in little clumps that grow to a height of 100 cm. The *C. rotundus* has a wide distribution and thrives in a variety of diverse habitats and conditions due to its ability to adapt to a wide range of varied soil types, temperatures, elevations, soil pH, and moisture levels (Singh et al., 2018).

The modern medical system is built on the active pharmaceutical component. The current review paper was prepared based on botany, phytoconstituents, and pharmacological activities in consideration of the significance of traditional medicine.

Characteristics Of *Cyperus rotundus*

Common perennial *C. rotundus* grows well in tropical and subtropical climates. It can grow as high as 50 cm from a rhizome and contains tiny tubers in the shape of nuts at the base of the stem (Figures 1 and 2).The leaves are erect and have three directions of orientation. Rhizomes, tubers, and roots have bent hairs covering them and are fibrous, highly branching structures. The plant's rhizomes are white, meaty, and covered with leaves while they are young; as they become older, they turn brown, fibrous, or wiry. At intervals of 5 to 25 cm, rhizomes produce subterranean tubers that proliferate and create tuber chains that extend to a large depth in the soil. When young, tubers are between two and three centimetres long, white, and juicy. When crushed, they release a spicy, pungent odour as they become older and turn fibrous brown nearly or return to white. They are also coated in papery scale leaves with apical buds that sprout new plants.(Imam *et al*., 2014; Barai *et al*., 2017)

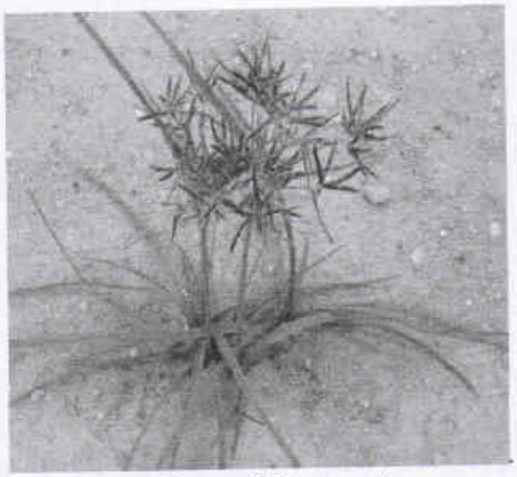

Fig.1. Plant of *C.rotundus*.

Fig.2. Rhizomes of *C.rotundus*

Microscopic Characters Of *Cyperus rotundus*

The micrograph of the root and shoot systems of *C. rotundus* shows an epidermis made of parenchymateous cells with the usual brownish colour, as shown in Figure 3 and 4. The hypodermis is made up of 1-2 layers of cells with thick walls, whereas the cortex is made up of parenchymateous cells. While the outside section is compressed, the inner portion is parenchymatous and has enormous intercellular spaces. More starch granules and dark oleoresinous substance are present in a few cortical cells (Sharma and Singh, 2011).Starch grains that are simple round or enlarged, numerous pigmented cells packed with a reddish-brown oleo-resin substance, present throughout the cortex and stele, vascular bundles encircled by bundle sheaths of fibres, vessels that are spiral to simple pithed, scattered throughout this area, and vessels that are simple round, oval, or elongated, as well as lignified secondary wall thickenings in the xylem (Nidugala *et al*., 2013).

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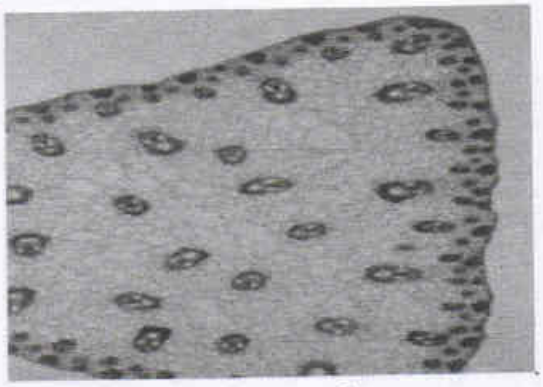

Fig.3 T.S.of *C.rotundus* stem.

Fig.4.T.S.of *C.rotundus* rhizome

Distribution

Among the areas where *C. rotundus* is common are the southern Ukraine, Afghanistan, the Caucasus, Iran, Yemen, Middle Asia, Iraq, Saudi Arabia, Syria, Lebanon, Palestine, and Turkey (except northern districts). Examples of regions outside the former Soviet Union include the western and eastern Mediterranean, the Atlantic, Minor and Central Asia, tropical Arabia, the Balkan Peninsula, Africa, Australia, North and South America, Europe, Japan, Korea, Taiwan, China, India, Nepal, Sri Lanka, Thailand, Vietnam, Myanmar, Indonesia, and Malaysia (Ali et al., 2016). It is a noxious weed that grows close to farmed crops. It does not fare well in the shadow and grows best on fertile moist soils that have been often cultivated.Common in disturbed settings, and once established, quite tenacious (Radanachaless et.al., 1994; Galinato et.al., 1999)

Phytochemistry Of *Cyperus rotundus*

The main chemical components include -cyperolone, -cyperone, -cymol, calcium, camphene, copaene, cyperene, cyperol, cyperolone, caryophyllene, cyperotundone, d-copadiene, d-epoxyguaiene, isocyperol, isokobusone, kobusone, limon (Zhou and Yin, 2012). Alkaloids, flavonoids, glycosides, phenols, tannins, steroids, starch, and several unique sesquiterpenoids are among the phytochemical components that have been the subject of earlier research (Harborne et al.,1982; Umerie and Ezeuzo, 2000; Kapadia et al., 1967; Trivedi et al.,1964; Sivapalan and Jeyadevan, 2012). Cypera-2,4(15)-diene, isorotundene, norrotundene, and the oxygenated molecule cyperadione were isolated and recognised as sesquiterpene hydrocarbons (Sonwa and Konig, 2001).

The plant C. rotundus has a variety of chemical components, including thiazol-4 and isobutyl lactate (5H) 25,26-dihydroxy-vitamin D3 yperolundone, one5-(4-nitrobenzylidenol)-2-phenyl, cis-pinen-3-ol, pyranone, trans-p-mentha-2,8-dienol, -santalol, cis-13,16-docasadienoic acid, cis-10-nonadecenoic acid, -vatiren Glucose, D-epoxyguaiene, D-fructose, and D-copadiene Flavonoids, isocyperol, isokobusone, kobusone, isocymene, limonene, linoleic acid, magnesium manganese, isoginkgetin, and sciadopitysin (Jain and Das, 2016; El Wakil et al., 2019). Anethole (16.2%), -selinene (23.7%), cuminaldehyde (9.2%), stearic acid (8.7%), arachidic acid (9.4%), and -cyperone (8.1%) made up the majority of the essential oil in the rhizome of C. rotundus (Ying and Bing, 2016).

*Cyperus rotundas*folkflore And Ethnomedical Claims

Children are given two teaspoonfuls of the C. rotundus tubers decoction daily for three days as a vermicide. Tuber juice purifies the blood and is used to heal skin issues (Nath et al., 2009). The rooted cuttings are used to treat gastrointestinal, hormonal, gynaecological, hair stimulation, uric acid, and psychiatric problems (Ghannadi etal., 2012).

Biological Activity Of *Cyperus rotundus* Antimutagens And Radical Scavengers

The Salmonella typhimurium test technique is used in this work to assess the mutagenic and antimutagenic effects of aqueous, total oligomers flavonods (TOF), ethyl acetate, and methanol extracts from aerial portions of Cyperus rotundus. When tested with

Salmonella typhimurium strains TA98, TA100, TA1535, and TA1538 either with or without the S9 mix, the various extracts exhibited no mutagenicity. As opposed to this, our findings demonstrated that all extracts had antimutagenic action against Aflatoxin B1 (AFB1) in the TA100 and TA98 assay systems, as well as sodium azide in the TA100 and TA1535 assay systems. The indirect mutagen AFB1 caused the Ames reaction, and the extracts of TOF, ethyl acetate, and methanol showed the highest amount of suppression of that response. a, and the, and a of the, to the. This year's, and for a,, Cicer a w an an an an an an a These extracts demonstrated significant free radical scavenging action against the 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical in addition to their antimutagenic activity. The IC50 values for TOF, ethyl acetate, and methanol extracts were 15, 14, and 20 g/ml, respectively. (Kilani Soumaya et.al.2005)

Antimicrobial

Patchoulenone, caryophylleneor-oxide, 10, 12-peroxycalamenene,and4,7-dimethyl-l-tetr alone were discovered using Anti malarial activity-guided analysis of *Cyperusrotundus* tubers. The newndoperoxidesesquiterpene, 10,12-peroxycalamenene, has the highest impact at ECso2.3310-6M. These compounds have anti malarial activity in the region of ECso10-4-10-6M. (Thebtaranonth C *et.al*.1995)

Wound Healing Activity

In three different rat models—the excision, the incision, and the dead space wound model—the wound healing efficacy of nitro furazone ointment (0.2% w/w) and an ethanolic extract of *C. rotundus* were compared. The *C. rotundus* ethanolic extract was used as an ointment. On day 18, 100% wound closure was seen when using 2% of the weight of the ethanolice extract of *C. rotundus*. Wound contractibility, time to wound closure, and tensile strength were used to monitor the wound healing process. According to Puratchikody et al. (2006), it was found to have much more wound healing action than regular nitro furazone.

Antiarthritic Activity

The antiarthritic activity of *Cyperus* species essential oils was studied in male wistar albino rats. Groups III and IV got 250 and 500 mg/kg of *C. esculentus* essential oil, respectively, while Groups V and VI received 250 and 500 mg/kg of *C. rotundus* essential oil. Group I served as the arthritic control group, while Group II received diclofenac sodium as the standard therapy. The left hind paw was given 0.1 ml of formaldehyde 2% v/v in normal saline to inject after measuring the baseline paw volume using a plethysmometer. Throughout the duration of the 10-day treatment, paw volume was measured each day.Rats given 500 mg of the essential oils of *C.esculentus* and *C. rotundus* had much less left hind paw edema than rats given diclofenac. When compared to the 81.37% inhibition shown in diclofenac treated rats on day 21, *C. rotundus* and *C. esculentus* showed a 75.54 and 76.58% inhibition in paw edema on the tenth and eleventh days, respectively. This demonstrates the antiarthritic properties of *Cyperus* species essential oils (Biradar et al., 2010).

Antidiarrheal Activity

When mice were given castor oil-induced diarrhoea, the methanol extract of *Cyperusrotundus* rhizome shown considerable antidiarrheal efficacy when administered orally at dosages of 250 and 500 mg/kg b.w. The petroleum ether fraction (PEF) and residual methanol fraction (RMF), both examined at 250 mg/kg, were shown to preserve activity, with the latter being more active than the control. The ethyl acetate fraction (EAF) lacked antidiarrheal properties.(Raut Nishikant et al.2006)

Antidibetic Activity

Investigations were conducted to determine *Cyperusrotundus's* impact on rats' alloxan-induced hyperglycemia in order to assess its traditional use in the treatment of diabetes.
The blood glucose levels were dramatically decreased by oral daily dose of 500 mg/kg of the extract (once daily for seven consecutive days). Since it demonstrated a potent DPPH radical scavenging effect in vitro, its antioxidant activity can be credited for its antihyperglycemic activity. (Raut Nishikant et al.2006)

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Antioxidant Activity

A number of in vitro assays involving free radicals and reactive oxygen species were used to evaluate the antioxidant activity of *Cyperusrotundus* rhizomes extract (CRRE), and IC50 values were calculated. On superoxide anion radicals, hydroxyl radicals, nitric oxide radicals, hydrogen peroxide, and the property of metal chelating and reducing power, CRRE demonstrated its scavenging function in a concentration-dependent way. The extract was further investigated for lipid peroxidation utilising young and old rat brain mitochondria and thiobarbituric acid-reactive compounds (TBARS). Additionally, the extract demonstrated concentration-dependent efficacy in reducing mitochondrial lipid peroxidation brought on by FeSO4 ascorbate. The findings of this study suggest that *C. rotundus* rhizome extract may have promise as a natural antioxidant source. [23]

Ovicidal And Larvicidal Activity

Aedes albopictus eggs and fourth instar larvae were used to test the ovicidal and larvicidal activity of essential oils isolated from the tubers of *Cyperus giganteus* and *Cyperusrotundus* Linn. The eggs and larvae were kept under observation for 24 hours after being subjected to successive oil concentrations ranging from 5-150 ppm. With EC50 values of 5 ppm and LC50 and LC90 values of 20 ppm, both oils demonstrated impressive ovicidal and larvicidal effects. The findings indicate that natural mosquitocidal agents may be found in the essential oils of certain Cyperus species. (Kempraj Vivek et al. 2008)

Antipyretic Activity

When albino rats are given a subcutaneous injection of a dried yeast in acacia in saline solution, the alcohol extract of *C. rotundus* has antipyretic effectiveness (Singh *etal*., 2012). In order to analyse the structure of the separated compounds using UV, IR, H and CNMR, and MS spectra, the methanol extract of the *C. rotundus* rhizome was repeatedly separated into its soluble fractions using column chromatography (Rajamanickam and Rajamanickam, 2016). Albino rats developed pyrexia after receiving a subcutaneous injection of a suspension of dried Brewer's yeast in gum acacia in ordinary saline; this condition was successfully treated with the alcohol extract of *C. rotundus*. The extract was discovered to have an antipyretic effect equivalent to that of when used on the same animal model.

Antiplatelet Activity

It was claimed that the ethanolic extract of *C. rotundus* has antiplatelet activity. It was investigated how the extract and eight of its chemical constituents affected platelet aggregations in vitro, ex vivo, and bleeding time. Sprague Dawley(SD) rats were used for the platelet aggregation experiment, while ICR mice were used for the tail bleeding time study. Collagen, thrombin, and arachidonic acid all had significant and concentration-dependent inhibitory effects on platelet aggregation, according to an in vitro study on the subject. In both ex vivo and in vitro studies, (+)-nootkatone was found to have the most inhibitory effect of the eight constituents on rat platelet aggregation. Additionally, (+)-nootkatone and the C. rotundus extract prolonged the mice's bleeding time.

Hepatoprotective Activity

Researchers investigated the hepatoprotective effects of a *C. rotundus* ethyl acetate rhizome extract against carbon tetrachloride-induced liver injury in rats. We assessed the levels of alkaline phosphatases (ALP), aspartate transaminase (AST), alanine transaminase (ALT), and total bilirubin. Oral administration of 100 mg/kg demonstrated a discernible protective effect. Additionally, histopathological analysis was done to back up the test (Suresh Kumar and Mishra, 2005).

Conclusion

The above mentioned data on the global application of *Cyperusrotundus* is compared to the literature that is currently accessible. Traditional and ethnobotanical applications of natural substances, particularly those with plant origins, have drawn a lot of interest in recent years since they have undergone extensive effectiveness testing and are widely regarded as safe for use by humans. The traditional method is the most effective when looking for novel compounds to treat various ailments.

A thorough review of the literature on *Cyperus rotundus* revealed that it is a common therapy for illnesses among many ethnic groups, Ayurvedic, and traditional practitioners. As this plant possesses other medicinal characteristics that are unknown, researchers are investigating its therapeutic potential.

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