

ETHNOPHARMACOLOGICAL STUDY OF *CYPERUS ROTUNDUS* - A HERB USED BY TRIBAL COMMUNITY AS A TRADITIONAL MEDICINE FOR TREATING VARIOUS DISEASES

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ABSTRACT

The purpose of this article is to study and to verify the therapeutic effects and margin of safety of traditional medicines used by the tribal community for treating various diseases as described in ancient literature found in our country. Herbs have been important contributors to the quality of human life for thousands of years. Herbal medicine is the oldest and most widely used form of medicine in the world today. Throughout history plants have served humankind as valuable components of seasonings, teas, cosmetics, dyes, and medicines. Medicinal plants have a traditionally important position in the socio-cultural, spiritual, and medicinal arena of rural and tribal lives throughout the world; India is rich in indigenous herbal resources due to its diverse climatic and soil conditions and multiple ecological regions. In Himalayan region of India, more than 2000 medicinal plant species exist. Although medicinal plants have been used since long, their scientific substantiation has recently been initiated. Looking into the steady expansion in the global population and prevalence of various diseases, such studies are the need of time to ensure availability of drugs in sustainable manner from natural sources for future generations. Based on the therapeutic and commercial importance of medicinal plants, the *Cyperus rotundus* has been undertaken to evaluate various ethnopharmacological parameters, as it has been used by number of tribal communities in Central part and Southern part of India. According to the WHO estimates about 80% of the of the world's population (mostly in developing countries) rely on traditional medicine, almost plant-based drugs, for their primary healthcare needs. Plants products also play an important role in the health-care systems of the remaining 20% of the population residing in developed countries. Currently, at least 122 phytoconstituents, derived from 94 plant species, can be considered as important drugs that are in use in one or more countries as therapeutic agents.

Keywords: Traditional medicines, Ethnopharmacological, Phytoconstituents, Diseases, Tribal communities and therapeutic agents, Medicinal plants, cosmetics, Dyes, Herbal medicines

INTRODUCTION

Currently, the world population is about 5-6 billion and the increase in this population is expected to rise up to 7.5 billion by the year 2020 [2]. According to the WHO estimates about 80% of the of the world's population (mostly in developing countries) rely on traditional medicine, almost plant-based drugs, for their primary healthcare needs [1,3]. Plants products also play an important role in the health-care systems of the remaining 20% of the population residing in developed countries. Analysis of data on prescriptions dispensed from community pharmacies in the United States from 1959 to 1980 indicates that about 25% contained plant extracts or active principles derived from higher plants. Currently, at least 122 chemical substances, derived from 94 plant species, can be considered as important drugs that are in use in one or more countries [3]. Modern pharmacopoeias still contain at least 25% drugs derived from plants while many others are synthetic analogs built on prototype compounds isolated from plants [4]. The demand for medicinal plants is steadily increasing in both developing and developed countries due to the growing recognition of drugs based on natural products and food supplements. Medicinal plants have a traditionally important position in the socio-cultural, spiritual, and medicinal arena of rural and tribal lives throughout the world; India is rich in indigenous herbal resources due to its diverse climatic and soil conditions and multiple ecological regions. There are more than 8000 plants species in South Asia with known medicinal uses, and they are an essential part of the traditional health-care system. In the Himalayan region of India, more than 2000 medicinal plant species exist. Although medicinal plants have been used since long, their scientific substantiation has recently been initiated [3], looking into the steady expansion in the global population and prevalence of various diseases; such studies are the need of time to ensure availability of drugs in a sustainable manner from natural sources for future generations.

Based on the therapeutic and commercial importance of medicinal plants, the *Cyperus rotundus* has been undertaken to evaluate various pharmacological parameters, (Fig. 1) as it has been used by a number of tribal communities in Central part and Southern part of India.

DESCRIPTION OF *CYPERUS ROTUNDUS* HERB

Scientific name: *Cyperus rotundus*
 Family: Cyperaceae
 Genus: *Cyperus*
 Species: *Rotundus*
 Local name: Motha, Nagarmotha

Habitat

It is a major weed of cultivated crops and gardens but only a minor weed elsewhere. It is encouraged by frequent cultivation and grows best in moist, fertile soils [5]. The plant is considered an invasive weed; it has been called "the world's worst weed." As an invasive weed, it is considered troublesome in 92 countries and adversely affects more than 50 crops, including sugar cane, corn, cotton, rice, and many vegetables. *Cyperus* grows rapidly and fills the soil with its tangle of roots and rhizomes; this one species (*C. rotundus*) can produce up to 40,000 kg/hectare of underground plant material.

Physical state

A closed canopy will shade it out. It can be controlled by thick, black, plastic mulches but not by organic mulches. It is slightly affected by competitive crops. It is able to tolerate shade and drought but grows well in reasonable light and moist, fertile soils [5].

Chemical state

Susceptible to: (1) Fumigants, including methyl bromide, dichlorodiphenyltrichloroethane, and chloropicrin at standard concentrations; (2) residual herbicides, including bromacil,

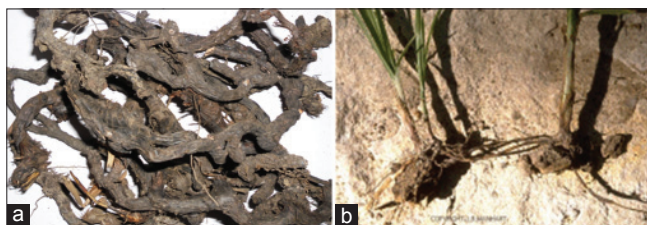


Fig. 1: (a and b) *Cyperus rotundus* rhizomes

Table 1: Phytoconstituents present in *Cyperus rotundus*

Phytoconstituent	Result
Tannins	+ve
Saponins	+ve
Alkaloids	-ve
Carbohydrates	+ve
Protein	+ve
Sterols	+ve
Volatile oil	+ve
Flavonoids	+ve
Triterpenoids	+ve
Glycoside	-ve
Fixed oil	-ve

EPTC, hexazinonc, trcbacil, pebulale, and vemolale at standard rates; (3) translocated herbicides, including glyphosate, amitrole, DSMA, and 2,4-D. Although control is often disappointing [5].

Biological state

Many attempts have been made at biological control, but no significant improvement appears to have resulted [7].

Botanical description [7]

This grass-like herb is found throughout India. It has tuberous roots or rhizomes that are fragrant. It has been mentioned in Sahasrayoga, Perennial herb with long rhizomes; sometimes tuberous; culms up to 60 cm tall; leaves 2-6 mm wide; spikes ovate, on rays to 6 cm long; spikelets linear, 1-2 cm long. 12-30 flowered, the rachilla winged; scales purplish, carinate, obtuse; achene sub-obovoid, trigonal, 1.5 mm long, black, minutely papillate [8].

PHYTOCONSTITUENTS AND COMMON USES

This medicinal plant is reported to be effective as attenuate antidyspeptic, aromatic, nervine tonic; alternative, diuretic, astringent and diaphoretic with other synonyms in *C. rotundus* Linn. *Cyperus tuberoses* (Rottb) Kirk and *Forma latimarginatus* Kirk. It belongs to family Cyperaceae. Usually, the Vedyas or Traditional Healers used its knotted tubers of black for the cure of fever, diarrhea, dysentery, dyspepsia, anorexia, loss of appetite, vomiting, cholera, liver dysfunctions, and brain debility [9]. The chemical investigation on this plant revealed a number of chemical constituents (Table 1) belonging to different classes such as fat, gum resins, carbohydrates, essential oils alkaloids, saponins, flavonoids, albuminous matters, fibers and ash, the major constituents of the oil are glycerides of oleic, palmitic and linoleic acids with small quantities of essential oil [9,10] 1,8 cineole, 4a, 5 α -oxidoeudesm-1 l-en-3a-ol, Alkaloids, α -cyperone, α -rotunol, β -cyperone, β -pinene, β -rotunol, β -selincne, calcium, camphene, copaene, cyperene, cyperone, cyperol, cyperolone [11] cyperolundone D-copadiene, D-epoxyguaiene, D-fructose, D-glucose, Flavonoids, γ -cymene, isocyperol, isokobusone, kobusone, limonene, linoleic-acid, linolenic-acid, magnesium manganese, mustakonc [10], a new saponin, myrsic acid and oleanolic-acid [10], Oleanolic-acid-3-O-neohesperidoside, oleic-acid, p-cymol, patchouienone, pectin. Polyphenols, rotundene [14], rotundenol [11], Rotundone, selinatrine, sitosterol, stearic-acid, sugeonol, sugetriol [13].

The reported constituents in volatile oil of *Cyperus* tubers vary with the source and quality of *C. rotundus*. The % yields of *C. rotundus* are cyperene, rotundone, and patchouienone. The volatile oil from traditional *C. rotundus* are sesquiterpenoids [15,16] as described in Table 1.

PHARMACOLOGICAL ACTIVITIES AND CLINICAL TRIALS

Abortifacient effect

Ethanol/water (1:1) extract, at a dose of 100.0 mg/kg administered orally to pregnant rats, was inactive.

Analgesic activity

Ethanol (95%) extracts of the entire plant, administered to mice at a dose of 500.0 mg/kg by gastric intubation and was found to be inactive. Ethanol (95%) and hot water extracts of dried rhizome, at a dose of 12.7 g/kg administered intraperitoneally to mice, were inactive versus hot plate method. Hot water extract, administered orally at a dose of 12.7 g/kg, was also inactive versus acetic acid writhing inhibition test. Alkaloid fraction, essential oil, and decoction of dried rhizome, administered to mice by gastric intubation, were active versus acetic acid-induced writhing.

Anthelmintic activity

Hot water extract of leaf, administered to mice, was inactive on *Nippostrongylus brasiliense*, *Trichostrongylus axei*, and *Syphacia obvelata*. Hot water extract of the tuber, administered orally to mice, was inactive on *N. brasiliense*, *S. obvelata*, and *T. axei* [17].

Antialcoholic activity

Fermented tuber, at a dose of 5.0 ml/animal in the ration of rats was active. Dose given daily for 90 days reversed alcohol-induced changes on the performance of neurologic tests, electroencephalogram, and electrocardiogram, fat deposition in liver and signs of hemorrhage, demyelination, and spongiosis [18].

Anticonvulsant activity

Ethanol (70%) extract of fresh roots, at variable dosage levels administered intraperitoneally to both sexes of mice, was active versus metra-zole-induced and strychnine-induced convulsions [25].

Antifungal activity

Rhizome, when tested on an agar plate, was active on *Colletotrichum chardonianum*, *Phytophthora capsid*, and *Sclerotinia scleroliorum*. Water extract of fresh shoots, undiluted on an agar plate, was inactive on *Helminthosporium turcicum* [26].

Antihepatotoxic activity

Methanol extract of rhizome, at a dose of 670.0 mg/kg administered orally to mice, was active in coronary care unit (CCU)-treated mice. Methanol extract of dried rhizome, at a dose of 670.0 mg/kg administered by gastric intubation to mice, showed strong activity versus CCU-induced hepatotoxicity [19]. Methanol extract of dried rhizome was active in rats. Activity was measured in terms of the elongation of hexobarbital sleeping time after CCU treatment. Elongation of sleeping time indicated negative results versus carbon tetrachloride (CCl₄) induced hepatotoxicity [20]. Dried tuber, when administered to mice, was active. The duration of hexobarbital sleeping time was used as a measurement for this activity versus CCl₄-induced hepatotoxicity. Ether extract of dried tuber, at a dose of 300.0 mg/kg administered to mice by gastric intubation, was inactive versus CCU-induced hepatotoxicity [27]. Water and methanol/water (1:1) extracts of dried rhizome, administered intraperitoneally to mice, were active versus CCU-induced hepatotoxicity [28].

Antihistamine activity

Ethanol/water (1:1) extract of dried rhizome, at a concentration of 0.001 g/ml, was active on guinea pig ileum [29].

Antihypertensive activity

Dried root, at a dose of 2.0 g/day taken by human adults, was active. 64 patients were given this drug for 2 months. There was a significant reduction in weight. Blood pressure was lowered in hypertensive patients but not in normotensive patients. Side effects were mild with some nausea and appetite suppression in 12 subjects [30].

Anti-inflammatory activity

Chloroform extract of dried roots, at a dose of 10.0 mg/kg administered intraperitoneally to rats, and water extract, at a dose of 500.0 mg/kg administered by gastric intubation, were active versus carrageenin-induced pedal edema [31]. Water extract, at a dose of 2.0% administered ophthalmically to human adults, produced a decreased in redness and reduced pain and ocular discharge in patients with conjunctivitis [32]. Methanol extract, at doses of 10.0 mg/kg and 5.0 mg/kg administered intraperitoneally to rats, was active versus carrageenin-induced edema and formalin-induced pedal edema, respectively. Petroleum ether extract, at a dose of 10.0 mg/kg administered intraperitoneally to rats, was also active. Water extract of rhizome was inactive in albumin stabilizing assay [33].

Antimalarial activity

Ethanol/water (50%) extract of dried aerial parts, at a concentration of 100 mcg/ml, was inactive on *Plasmodium berghei*. The extract was toxic at this dose. The extract, when administered by gastric intubation to mice at a dose of 10 g/kg, was active on *P. berghei*. With daily dosing for 4 days, inhibition was 49% [34]. Chloroform extract of dried tuber was active on *Plasmodium falciparum*, IC50 10.0 mg/ml versus hypoxanthine uptake by plasmodia [35]. Both methanol and petroleum ether extracts were inactive IC50 49.0 mg/ml was obtained for both extracts versus hypoxanthine uptake by plasmodia. Hexane extract of dried tuber was active on *P. falciparum* ED 0.66 mcg/ml [36].

Antioxidant activity

Methanol extract of dried rhizome, at a dose of 1.6 g/kg administered by gastric intubation to mice, was inactive versus ethanol-induced lipid peroxidation in mouse liver. Dose expressed as dry weight of plant [37].

Antipyretic activity

Ethanol (95%) extracts of the entire plant, administered to mice at a dose of 500 mg/kg by gastric intubation, was active versus yeast-induced pyrexia [38]. Water extract of dried rhizome, at a dose of 0.5 g/kg administered by gastric intubation to rats, was active. Effect was seen 4.5 hrs after treatment versus yeast-induced pyrexia [38]. Methanol extract of dried root, at a dose of 5.0 mg/kg administered intraperitoneally to rats, was active versus pyrexia induced by yeast injection [39].

Coronary vasodilator activity

Water extract of rhizome, administered intravenously to cats, rabbits, and frogs, was active [11].

Hair stimulant effect

Ethanol (95%) extract of dried tuber, at a concentration of 0.4 g/animal applied externally to male mice, was inactive [40].

Hematopoietic activity

Powdered dried plant, administered to human adults at variable dosages, was active. Patients also received another preparation containing *Panax ginseng*, *Cervus elaphus*, *Chinemys reevesii*, *Cervus* species, and *Schisandra chinensis* 125 concomitantly over 3 months [41].

Hypertensive activity

Water extract of dried fat, at a dose of 1.5 mg/kg administered intravenously to rats, was active. A vasopressor and then a vasodepressor response occurred following administration of extract. Hypotensive response was blocked by administration of propranolol and atropine but not by chlorisondamine, prazosin, and cyproheptadine. Extract used was composed of roots of *Angelica koreana*, *Peucedanum*

japonicum, *Angelica gigas*, *Lindera strychnifolia*, *Angelica dahurica*, *Glycyrrhiza glabra*, and *Asiasarum* species. Furthermore, included were rhizomes of *Cnidium officinale*, *Pinellia ternata*, *Cyperus rotundus*, and *Zingiber officinale*, with branches of *Innamomnt cassia*, the fruit of *Pachyma hoelen* and *Citrus aurantium* plants [22].

Smooth muscle relaxant activity

Methanol extract of rhizome, at a concentration of 1.0 mg/ml, was inactive on rat ileum. The extract's smooth muscle stimulant activity was also inactive on rat ileum. However, uterine relaxation effect on rat uterus was strongly active oxytocin-induced contractions. No uterine stimulant effect was shown on rat uterus [24].

Uric acid decrease

Fermented dried tuber, at a dose of 5.0 ml/day in the ration of rats, was active. Rats were fed the SKV Indian herbal formula for 3-4 months versus rats fed alcohol for 6 months [18].

Weight loss

Dried root, taken by human adults orally at a dose of 20 g/day, was active. 64 obese patients were given this drug twice daily for 2 months. There was a significant reduction in weight. Blood pressure was found on the lower side in hypertensive patients but not in normotensive patients. Side effects were mild, with some nausea initially and appetite suppression in 12 subjects [21].

CONCLUSION

Hence, the herbs and herbal preparations have immense influence over the daily life of human being, and their fenestration is far and wide in the society. Even for the treatment of common ailments, we take the help of Herbal Traditional Formulations as they are reliable, time tested, time trusted, compatible to our system and relatively cheap, easily available, and most importantly they are free from untoward side effect, toxicity, and menace of developing resistance toward disease-causing organism.

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