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Review Article

# *CYPERUS SCARIOSUS*: A POTENTIAL MEDICINAL HERB

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**ABSTRACT**
Herbal products demand is growing exponentially throughout the world and various pharmaceutical sectors are currently conducting extensive research on plant materials for their potential medicinal value. *Cyperus scariosus* have been widely used as anti-inflammatory, astringent, antimicrobial, hypotensive, stimulant of central nervous system, hepatoprotective, antidiabetic, analgesic. It contains essential oil, terpenoids, sesquiterpenes, hydrocarbons, steroidal saponins, ketones and flavonoids. It remained to be an important ingredient of several prescriptions used in indigenous system of medicine to treat a variety of diseases including diarrhea, epilepsy, gonorrhea, syphilis and liver damage. The essential oil obtained on steam distillation of rhizomes of the plant has its value in perfumary and is also known to possess antibacterial, antifungal, antidepressant and spasmolytic activities. The present review article provides an overview on potent pharmacological properties exhibited by this plant.
**Keywords:** Herbal, *Cyperus scariosus*, essential oil, potent pharmacological properties.

## INTRODUCTION

Herbal-derived substances remain the basis for a large proportion of the commercial medications used today for the treatment of various diseases. A great number of modern drugs are still derived from natural sources, and 25% of all prescriptions contain one or more active ingredients from plants. About 500 plants with medicinal use are mentioned in ancient literature and around 800 plants have been used in indigenous systems of medicine. India is a vast repository of medicinal plants that are used in traditional medical treatments[1]. Many herbal plants have been described in ancient literature and have been used by ancient Indian physicians. Medicinal plants play a vital role in the development potent therapeutic agents. Ayurveda has been the first to give an elaborate description of diseases, their clinical features and patterns and management by herbal plants. *Cyperus scariosus* belongs to family Cyperaceae, commonly known as "Nagarmotha" in Hindi[2] and "Nut grass" in English. *Cyperus scariosus* is a delicate grass, available in different places of Bangladesh and in eastern and southern parts of Indo-Pak subcontinent[3]. The genus *Cyperus* is widely distributed throughout the world and consists of about 700 species of which around 60 species occur in India. Some of them are used as fodder; a few, yielding culms and leaves and yet others yielding tuberous rhizomes are used for edible, medicinal and perfumery purposes[4]. Plant roots have a folkloric reputation as a cordial, tonic, desiccant, emmenagogue, diaphoretic and vermifuge[5]. It remained to be an important ingredient of several prescriptions used in indigenous system of medicine to treat a variety of diseases including diarrhea, epilepsy, fever, gonorrhea, syphilis and liver damage[6]. The essential oil obtained on steam distillation of rhizomes and roots of the plant has its value in perfumery[7] and is also known to possess antibacterial[8], antifungal[9] as well as plant growth-regulating properties[10], analgesic and antidiabetic activity[11], hepatoprotective activity[12], hypotensive and spasmolytic activity[13]. This plant is widely used for diuretic, astringent, anti-inflammatory, antimicrobial, stimulant of central nervous system. Rhizomes are used for washing hair and as antidote to snake bite. Oil obtained from tubers (rhizomes) is used by perfumers as fixative. It forms good substitute for patchouli oil in soap and other perfumes. Oil is also used as hair tonic.

### Botanical Description

*Cyperus scariosus* is a small grass-like herb with angular soft stem and underground rhizomatous tubers. The plant is a glabrous herb. Stolons are slender, 0.8-5.0cm by 0.25cm, clothed by elliptic, acute, lax striate concolorous scales 1/8inch long, stem 40-90cm long, slender, triquetrous at top 1/24-1/16inch in diameter, leaves are variable, usually short (less than 1/3 stem), narrow, weak, and umbels are slender, contracted, rays slender sometimes up to 3inch long, and bracts are nearly always as the leaves i.e. hardly any when leaves short, exceeding inflorescence when leaves longish, and spikelets are linear pale straw-colour (Figure I) and rhizome are very short, woody, stolons, lateral shoots from base of stem immediately ascending, glumes scarcely imbricate in fruit. The rhizome of this plant contains an amber or light brown viscous essential oil (Figure II).

### Phytochemical Constituents

Phytochemical studies revealed that *Cyperus scariosus* has numerous chemical constituents, major chemical constituents of this herb are essential oils, flavonoids, terpenoids, mono and sesquiterpenes, hydrocarbons[14], steroids, saponin, ketones[15],1,8-cineole, 4α,5α-oxidoeudesm-11-en-3-α-ol, alkaloids, α-cyperone(III), α-rotunol, β-cyperone, β-pinene, β-rotunol, β-selinene, Calcium, Camphene, Copaene, Cyperene, Cyperenone, Cyperol(IV), Cyperolone, Cyperotundone(V), copadiene, γ-cymene, Isocyperol(VI), Isokobusone, Kobusone, Limonene, Linoleic-acid, Linolenic-acid, Magnesium, Manganese, Mustakone, Myristic-acid, Oleanolic-acid, Oleanolic-acid-3-o-neohesperidoside, Oleic-acid, P-cymol, Patchoulenone, Pectin, Polyphenols, Selinatriene, Sitosterol, Stearic-acid, Sugeonol(VII), Sugetriol,α-cyperone, β-selinene, cyperene(VIII), cyperotundone, patchoulenone, sugeonol, kobusone, and isokobusone many of which may show pharmacological activity, but the main active components appear to be the sesquiterpenes. Stigmasta-5,24(28)-diene-3-β-*O*-α-L rhamnopyranosyl-*O*- β-D-arabino-pyranoside[16] (IX) and a

new glycoside leptosidin6-*O*- β -D-glucopyranosyl-*O*- α -2-rhamnopyranoside[17] was isolated from the leaves and (–)-β-selinene (X) and a new tricyclic hydrocarbon, isopatchoula-3,5-diene[18](XI) isolated from *Cyperus scariosus* oil. Essential oil, sesquiterpene[19], cyperenone, cyperenol, patchoulenol, isopatchoulenone, Rotundene [20](XII), rotundenol, 2, 3-diacetoxy-19-hydroxy-urs-12-ene-24-O-β-D – xylopyranoside[21] (XIII) isolated from rhizomes of this plant.

**Pharmacological activities**

**Anti-hyperglycemic Activity**

The results from the investigation suggested that the methanol extract of *Cyperus scariosus* leaves exhibited dose-dependent and significant anti-hyperglycemic activity in glucose-induced hyperglycemic mice. The extract showed very little effect at lower doses but at higher doses showed significant effect compared to control. The maximum inhibition effect was found with the dose of 400mg extract/kg body weight (46.86%), which was close to that of the standard drug glibenclamide (57.62%) at 10mg/kg body weight dose. The result from the glucose loaded hyperglycemic mice model showed that the methanol extract of *Cyperus scariosus* leaves at the doses of 200mg/kg body weight and 400mg/kg body weight significantly inhibited the rise of glycemia. This observation suggests that the extract may act by potentiating the pancreatic secretion or increasing the glucose uptake or inhibiting glucose absorption for gut.

**Anti-depressant Activity**

The study was undertaken for comparative pharmacological evaluation of *Cyperus scariosus* oil and imipramine for antidepressant activity. The result shows *Cyperus scariosus* oil possesses antidepressant effects. Imipramine (15mg/kg, p.o.) and herbal extract of *Cyperus scariosus* oil (100 and 200mg/kg, p.o) were subjected for its antidepressant activity using two different experimental models of depression Tail Suspension test (TST) and Forced Swim Test (FST) in Swiss albino male mice. After administration of a single oral dose, statistically significant decrease in the immobility time in TST and FST was observed with drug treated animal at 100 and 200mg/kg, when compared to the control group. Duration of immobility was significant at from the first day with standard drug imipramine. The extent of decrease in immobility time in was found at dose dependent and increases with the days of treatment. The results of the present study indicated that the pattern of behaviors exerted by the extract in the FST and TST is similar to that of imipramine, it may be concluded that this effect might be related to inhibition of nor-epinephrine uptake which eventually leads to increased availability of nor-epinephrine in synapses[22].

**Anti-nociceptive Activity**

In the acetic acid-induced writhing model mice, administration of methanol extract of leaf of *Cyperus scariosus* showed significant dose-dependent writhing inhibition. For the methanol extract of leaves, the maximum inhibition of writhing (46.62%) was obtained at the dose of 200mg extract/kg body weight ($p<0.01$), whereas the standard anti nociceptive drug, aspirin caused 56.74% ($p<0.001$) writhing inhibition at the same dose. Intra-peritoneal administration of acetic acid (1%) leads to pain and inflammation mainly through production of prostaglandins (mainly prostacyclines (PGI2) and prostaglandin-E (PG-E)), which have been reported to be responsible for excitation of the A-δ-nerve fibers, leading to sensation of pain. Therefore any agent that lowers the number of writhing will demonstrate analgesia by inhibition of prostaglandin synthesis. The major conclusion was that leaf extract of *Cyperus scariosus* caused reduction of the number of abdominal constrictions as well as stretching of hind limbs induced by the intra peritoneal injection of acetic acid in a dose-dependent manner, which suggest that methanol extract of *Cyperus scariosus* leaf possess significant anti nociceptive properties.

**Anti-bacterial Activity**

It is evident from the study that longiverbenone isolated from *Cyperus scariosus* rhizome exhibited moderate to good antibacterial activity against the organisms tested herein. It appeared that the compound gave moderate to good antibacterial activity against all the test bacteria except *P. aeruginisa* and *S. aureus*. The *in vitro* antibacterial activities of the column separated fractions and of the chemically isolated pure compound longiverbenone of the plant were determined against eleven potential human pathogenic bacteria by disc diffusion method[23] using Mueller- Hinton (agar and broth) medium. All the results were compared with the standard antibacterial antibiotic ampicillin (20µg/disc). Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were determined by macrodilution broth technique[24]. The largest zone of inhibitions 30, 22, 15 and 8mm in diameter were recorded against *Vibrio cohlearae* at the concentration of 160, 80, 40 and 20µg/disc respectively. Standard antibacterial antibiotic ampicillin (20µg/disc) was also found to be active against all the bacteria tested herein except *P. aeruginosa*. The MIC values of the compound longiverbenone were 20µg/ml against *V. cholerae*, 40µg/ml against *Bacillus subtilis*, *B. cereus*, *B. megaterium* and *S. dysenteriae*, 80µg/ml against *E. coli* and *S. paratyphi*, and 160µg/ml against *S. sonnei* and *S. typhi*. *S. aureus* was found to resistant to the agent showing growth in the presence of the highest concentration used (320µg/ml). The MBC values of the agent varied between 80 and 320µg/ml in case of eight organisms with the lowest (80µg/ml) against *V. cholerae*.

**Cytotoxic Activity**

This study was carried out to investigate the cytotoxic potential of longiverbenone isolated from *Cyperus scariosus* rhizome. The $LC_{50}$ test was performed on new born brine shrimp (*Artemia salina*) according to an established method[8]. The median lethal concentration 50% ($LC_{50}$) of the test compound (1.5625 to 20µg/ml water) was calculated by trend line fit linear regression analysis of the experimentally obtained data. The $LC_{50}$ of the compound against the brine shrimp was found to be 14.38µg/ml. The cytotoxic bioassay result of longiverbenone may lead to the exploration of its potential and practical application as a novel less toxic[25].

**Immunosuppressant Activity**

The results from the investigation suggested that *Cyperus scariosus* causes immune suppression by inhibiting Th1 cytokines in Balb/C mice. The extract was fractionated with chloroform, n-butanol and water and then used to investigate the T-cell specific immune suppressive potential of these fractions by flow cytometry. On p.o. administration, *Cyperus scariosus* inhibited both humoral and cell-mediated immune responses significantly ($p < 0.01$) by suppressing primary (26.8%) and secondary (29.7%) antibody titres and also

inhibited cell-mediated delayed type hypersensitivity (DTH) immune response (45.9%) at 600mg/kg dose, phagocytosis-both *in vitro* (37.4%) and *ex vivo* (37.8%) and delayed the graft rejection time (45.8%), thus confirming marked immune suppression. Out of the three isolated fractions, only the chloroform fraction significantly ($p < 0.01$) suppressed CD8+/ CD4+ T cell surface markers (14.0/25.3%) and intra-cellular Th1 cytokines, viz, IL-2 (34.4%), and IFN-_ (34.7%), compared to cyclosporine-A, a standard T cell inhibitor (53.6%) which was given to Balb/C mice at 200mg/kg dose. *C. scariosus* chloroform fraction (CSC) did not significantly ($p < 0.01$) suppress Th2 (IL-4) system[26].

**Hepato-protective Activity**

The hepatoprotective activity of aqueous-methanolic extract of *Cyperus scariosus* (Cyperaceae) was investigated against acetaminophen and CCl4-induced hepatic damage. Acetaminophen produced 100% mortality at a dose of 1g/kg in mice while pretreatment of animals with plant extract (500mg/kg) reduced the death rate to 30%. Acetaminophen at a dose of 640mg/kg produced liver damage in rats as manifested by the rise in serum levels of Alkaline Phosphatase (ALP), Glutamate Oxaloacetate Transaminase (GOT) and Glutamate Pyruvate Transaminase (GPT) to 430 +/- 68, 867 +/- 305 and 732 +/- 212 IU/l (n = 10) respectively, compared to respective control values of 202 +/- 36, 59 +/- 14 and 38 +/- 7. Pretreatment of rats with plant extract (500mg/kg) significantly lowered ($P < 0.05$) the respective serum ALP; GOT and GPT levels to 192 +/- 31, 63 +/- 9 and 35 +/- 8. The hepatotoxic dose of CCl4 (1.5ml/kg; orally) raised serum ALP, GOT and GPT levels to 328 +/- 30, 493 +/- 102 and 357 +/- 109 IU/l (n = 10) respectively, compared to respective control values of 177 +/- 21, 106 +/- 15 and 47 +/- 12. The same dose of plant extract (500mg/kg) was able to significantly prevent ($P < 0.05$) CCl4-induced rise in serum enzymes and the estimated values of ALP, GOT and GPT were 220 +/- 30, 207 +/- 95 and 75 +/- 38, respectively. The plant extract also prevented CCl4-induced prolongation in pentobarbital sleeping time confirming hepatoprotectivity.

**Figure I: *Cyperus* Leaves**

**Figure II: *Cyperus* Rhizomes**

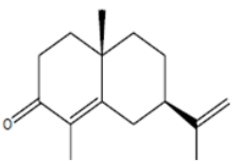

**Figure III: α-Cyperone**

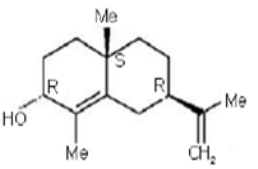


**Figure IV: Cyperol**

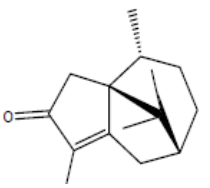

**Figure V: Cyperotundone**

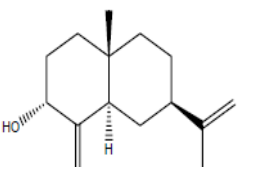


**Figure VI: Isocyperol**

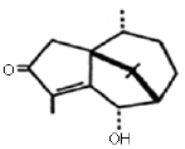


**Figure VII: Sugeonol**

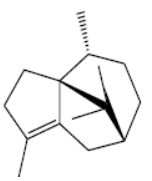

**Figure VIII: Cyperene**

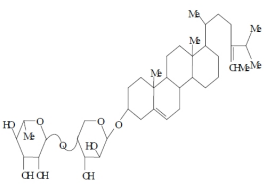

**Figure IX: Stigmasta-5, 24(28)-diene-3-β-*O*-α-L rhamnopyranosyl-*O*- β-D-arabino-pyranoside**

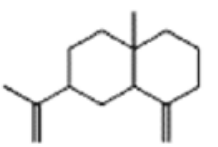

**Figure X: (–)-β-Selinene**

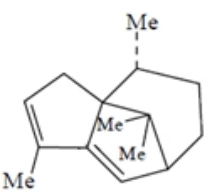


**Figure XI: Isopatchoula-3, 5-diene**

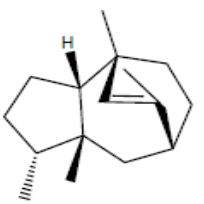


**Figure XII: Rotundene**

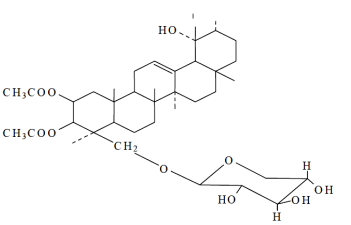


**Figure XIII: 2, 3-diacetoxy-19-hydroxy-urs-12-ene-24-O-β-D –xylopyranoside**

## CONCLUSION

The above collected information regarding the uses and pharmacological activities of *Cyperus scariosus* is matched with available literature. In the present scenario, 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 scariosus* 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.

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