

Kyllinga nemoralis (Hutch & Dalz) (Cyperaceae): Ethnobotany, Phytochemistry and Pharmacology

Raju S^{*1}, Kavimani S², Uma Maheshwara rao V³, Sreeramulu Reddy K⁴

¹Assistant Professor, Vijaya College of Pharmacy, Munaganoor, Ranga Reddy Dist, Andhra Pradesh, India-505511.

²Mother Theresa Post Graduate Institute of Health Sciences, Gorimedu, Puducherry, India. ³Nalla Narsimha Reddy College of Pharmacy, Korremula, Ranga Reddy Dist, Andhra Pradesh. ⁴Assistant manager –Clinical R&D, Shantha Biotechnics Limited, Hyderabad, Andhra Pradesh. India- 500004.

ABSTRACT

Many herbal remedies have so far been employed for the treatment and management of various ailments since the beginning of human civilization. *Kyllinga nemoralis* (Hutch & Dalz) (Cyperaceae) is a plant widely used throughout the world and frequently used for its anti-venom property. The aim of this review was to collect all available scientific literature published and combine it into this review. The present review comprises the ethnobotanical, phytochemical and pharmacological potential of *Kyllinga nemoralis*. The present review includes 19 references compiled from major databases as Chemical Abstracts, Science Direct, SciFinder, PubMed, Dr. Dukes Phytochemical and Ethnobotany. An exhaustive survey of literature revealed that flavonoids, saponins, phenols, terpenes, lipids and glycosides constitute major classes of phytoconstituents of this plant. Pharmacological reports revealed that it is having analgesic, antidiabetic, anticancer, antioxidant, antimicrobial, hepatoprotective and antimalarial properties. *Kyllinga nemoralis* seems to hold great potential for in-depth investigation for various biological activities. Through this review, the authors hope to attract the attention of natural product researchers throughout the world to focus on the unexplored potential of *Kyllinga nemoralis*, and it may be useful in developing new formulations with more therapeutic value.

Key words: Ethnobotany, Phytochemistry, Pharmacology, Antivenom, *Kyllinga nemoralis*

INTRODUCTION

The use of natural products with therapeutic properties is as ancient as human civilization and, for a long time, mineral, plant and animal products were the main sources of drugs. De Pasquale, 1984 A. De Pasquale, Pharmacognosy: the oldest modern science, *Journal of Ethnopharmacology* **11** (1984), pp. 1-16. Abstract | PDF (1361 K) | View Record in Scopus | Cited By in Scopus (15) In recent years, there has been growing interest in alternative therapies and the therapeutic use of natural products, especially those derived from plants. This interest in drugs of plant origin is due to several reasons, namely, conventional medicine can be inefficient (e.g. side effects and ineffective therapy), abusive and/or incorrect use of synthetic drugs results in side effects and other problems.^[1] The Indian subcontinent The Indian sub-continent comprising of the countries India, Pakistan, and Bangladesh is the site of one of the oldest civilizations,

and it has seen the development of many traditional health care systems. Their development was supported by the great biodiversity in flora and fauna due to variations in geography and climate.^[2] Many weedy plants possess medicinal and therapeutic and therapeutic activities.^[3,4]

The Cyperaceae family comprising of monocotyledonous flowering plants known as sedges, which superficially resemble grasses or rushes. The family is large, with some 5,500 species described in about 109 genera. These species are widely distributed, with the centers of diversity for the group occurring in tropical Asia and tropical South America. Members of the family Cyperaceae are called Motha as a folkore name in different parts of the country and used as ethno medicinal plants for treatment of diverse ailments.^[5] Some well-known sedges include the water chestnut (*Eleocharis dulcis*) and the papyrus sedge (*Cyperus papyrus*), from which the Ancient Egyptian writing material was made. This family also includes cotton-grass (*Eriophorum*), spike-rush (*Eleocharis*), sawgrass (*Cladium*), nutsedge or nutgrass (*Cyperus rotundus*, a common lawn weed), the large genus of *Carex*, and white star sedge (*Rhynchospora colorata*) and Whitehead spike sedge (*Kyllinga nemoralis*). This review aims at describing the traditional uses, phytochemical profiles

*Address for correspondence:

Ph: +91 9966164766

Email:rajenderreddysama@gmail.com

DOI: 10.5530/pj.2011.24.2

and therapeutic potential of various parts of *Kyllinga nemoralis*, which has been used in traditional practice for many years.

CLASSIFICATION^[6]

- Domain: Eukaryota
- Kingdom Plantae – Plants
- Subkingdom Tracheobionta – Vascular plants
- Superdivision Spermatophyta – Seed plants
- Division Magnoliophyta – Flowering plants
- Class Liliopsida – Monocotyledons
- Subclass Commelinidae
- Order Cyperales
- Family Cyperaceae – Sedge family
- Genus *Kyllinga* Rottb. – spike sedge
- Species *Kyllinga nemoralis* (J.R. Forst. & G. Forst.) Dandy ex Hutch. & Dalziel – whitehead spike sedge

DESCRIPTION OF KYLLINGA NEMORALIS

Kyllinga nemoralis (Hutch & Dalz) (Family; Cyperaceae) is a perennial herb, grass-like in habit, propagated by seed and a creeping rhizome with many synonyms and common names. Synonyms include *Cyperus kyllingia* Endl, *Kyllinga monocephala* Rottb and *Kyllinga cephalotes* (Jacq.) and Common names include Whitehead spike sedge, white kyllinga, white water sedge, white-flowered kyllinga, poverty grass. Grow

chiefly in marshy and wet places and is well distributed over all parts of the world. This plant is commonly known as Apavisha, Nirbishi and Velutta nirbasi.

It is found in waste places, open grasslands, etc., at low and medium altitudes. It is pantropic in distribution. The plant is more or less glabrous, arising from creeping rootstocks. The stems are usually solitary, 10 to 40 centimeters high. The leaves are up to 15 centimeters in length or longer, 3 to 4 millimeters wide; with the bracts similar. The spikes are ovoid, simple, white, 8 to 13 millimeters long. The spikelets are very numerous, 3 to 3.5 millimeters long, the flowering glume distinctly winged along the keel. The fruit is an achene, approximately 1.2-1.5 mm long x 0.5-0.7 mm wide.^[7]

ETHNOBOTANY

Kyllinga nemoralis leaves and rhizomes contain many biologically active chemicals, and extracts from those tissues have been used in traditional folk medicine to treat many diseases and conditions. The plant leaves are traditionally used for the relief of malarial chills, pruritus of the skin, and thirst due to fever and diabetes.^[8] In India plant leaves are used as anti-venom.^[9, 10] The rhizomes of the plant are fragrant, sweet, refrigerant, antidiarrhoeal, diuretic, stomachic, and expectorant.^[11, 12] The paste of rhizomes mixed with milk is used internally for worm infection.^[13] It is also used in fever, hepatopathy, splenopathy, diabetes and tumours.^[14]

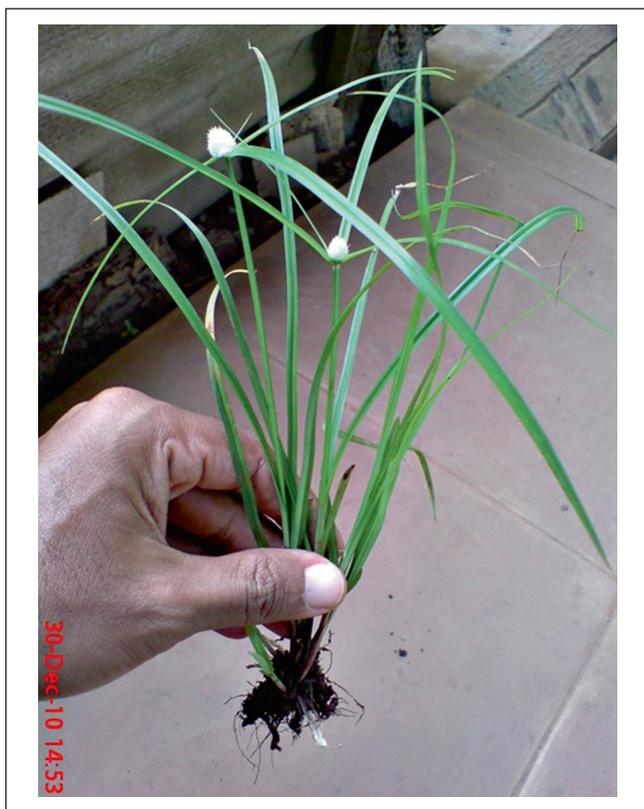
PHYTOCHEMISTRY

Only a few studies have reported on the Phytochemistry of *K. monocephala*. Underground parts contain essential oils rich in terpenes α -cyperone, β -selinene, and α -humulene.^[15] The methanolic and aqueous extract from the plant leaves were positive for terpenoids, saponins and phenolic compounds.^[16] More recently, ethanolic extract of the rhizomes possesses flavonoids, triterpenoids and glycosides and the petroleum ether extract was found to possess triterpenoids and glycosides.^[17] Essential oil from fresh aerial parts by hydrodistillation from *Cyperus kyllingia* Endl. was analyzed by a GC, GC-MS. Twenty-three compounds were identified, mainly of oxygenated sesquiterpenes, particularly sesquiterpene hydrocarbons, and carboxylic acid. The most representative compounds were α -cadinol, caryophyllene oxide, α -muurolol, α -humulene, and α -atlantone.^[18]

PHARMACOLOGICAL SCREENING

Analgesic activity

The analgesic activity of the methanol extract of the leaves of *Kyllinga monocephala* Rottb. (Cyperaceae) was evaluated using



the acetic acid-induced writhing test on mice and was found to significantly reduce the number of writhes in mice by half. Following a bioassay-guided fractionation scheme, statistically significant analgesic activity was observed with both the hexane and ethyl acetate partitions.^[19] In another report the methanol extract of *K. monocephala* was found to significantly reduce the number of writhes in mice administered intraperitoneally with acetic acid to induce abdominal constriction.^[16]

HEPATOPROTECTIVE ACTIVITY

Hepatoprotective activity of ethanolic and petroleum ether extracts of rhizomes of *Kyllinga nemoralis* was evaluated against carbon tetrachloride (CCl₄)-induced hepatotoxicity in rats at a dose 100 and 200 mg/kg, p.o. Both extracts showed significant hepatoprotection when compared to control, similar to standard silymarin. Histology of liver sections also revealed that the extracts protected liver from injury. Ethanolic extract possesses flavonoids, triterpenoids and glycosides and the petroleum ether extract was found to possess triterpenoids and lipids. The hepatoprotective effect produced may be probably due to the triterpenoids, which is common in both of these extracts.^[17]

HYPOLYCEMIC ACTIVITY

The hypoglycemic activity of Fresh plant infusion of *Kyllinga nemoralis* was monitored using the Oral Glucose Tolerance Test. Screening of the Blood glucose level of the animals was performed by the glucose oxidase method using a commercially available glucometer. *Kyllinga nemoralis* exhibited significant hypoglycemic activity when given 15 min after glucose load.^[16]

ANTIMALARIAL, ANTICANCER AND ANTIMICROBIAL ACTIVITIES

Essential oil from fresh aerial parts by hydrodistillation from *Kyllinga nemoralis* was evaluated for antimalarial, anticancer and antimicrobial Activities. Antimalarial activity against *P. falciparum* (K1) was determined by microculture radioisotope Techniques. The anticancer activity tested against the NCI-H187 cells. The preliminary antimicrobial activities were also evaluated using the agar diffusion method. The microorganisms used were: *Escherichia coli* ATCC25922, *Staphylococcus aureus* ATCC25923, *Pseudomonas aeruginosa* ATCC27553, *Candida albican*, *Aspergillus flavus* and *Trichophyton mentagrophyte*. The oil showed significant activities against *P. falciparum* (K1) and NCI-H187 (Small Cell Lung Cancer) with the IC₅₀ values of 7.52 and 7.72 µg/mL, respectively. The potent activities of the oil might be attributable to its high sesquiterpene content.^[18]

CONCLUSION

Kyllinga nemoralis is a wealth of indigenous knowledge and traditional uses have been documented for this species. While this review has attempted to unite the relevant information for this species the data clearly suggests future research priorities. Convincing ethnopharmacological evidence is presented alluding to the extensive use of *Kyllinga nemoralis* as antivenom. It is interesting to note that the earlier scientific investigations of this plant, *Kyllinga nemoralis*, showed the crude extracts exhibited analgesic, antimicrobial, hypoglycemic, anticancer, hepatoprotective and antimalarial properties. This review revealed that flavonoids, triterpenoids especially sesquiterpenes, glycosides, saponins, phenolic compounds and lipids constitute major classes of phytoconstituents of this plant. Monoterpenes, Polyphenols, saponins and flavonoids are well known for their biological properties and although a suite of compounds belonging to this class of phytochemicals have been identified, very few have been subjected to pharmacological assays. This plant can become important sources of novel drugs and lead compounds.

REFERENCES

1. Rates SMK, Plants as source of drugs, Toxicon, 2001, 39(5):603-613.
2. Sarfaraj Hussain Md, Sheeba Fareed, Mohd Ali, Hygrophila auriculata (K. Schum) Heine: Ethnobotany, Phytochemistry and pharmacology, Asian Journal of Traditional Medicines, 2010, 5 (4):122-131.
3. Kirtikar K.R and Basu BD. Indian Medicinal Plants, Vol. IV, Bishan Singh Mahendra Paul Singh, DehraDun, India, 1935, 2634.
4. Jain SK. Dictionary of Indian Folk Medicine and Ethnobotany, Deep Publications, New Delhi, 1991, p. 68.
5. Kumar K, Upadhyay OP, and Tiwari RK. Ethano-medico studies on Motha-A folkore name used by tribal community for different species of Cyperaceae family, Sachitra Ayurved, 1996; 49(5):369-372.
6. Harold SJ. Nomenclature of plants, The Ronald press company USA, 1958, P.55.
7. Kirtikar KR, Basu B.D. Indian Medicinal Plants, third ed. Indological and Orient Publishers, New Delhi, 2000, p. 2634.
8. Quisumbing E. Medicinal Plants of the Philippines. Quezon City, Philippines, Katha Publishing, 1978, pp. 116-117.
9. Oudhia P. Medicinal weeds in the rice fields of Chattisgarh, India, 1999, IRRN 24:40.
10. Manju Panghal, Vedpriya Arya, Sanjay Yadav, Sunil Kumar, Jaya Parkash Yadav. Indigenous knowledge of medicinal plants used by Saperas community of Khetawas, Jhajjar District, Haryana, India. Journal of Ethnobiology and Ethnomedicine 2010, 6:4:1-11.
11. Khory NR and Katrak NN. Materia medica of india and their therapeutics, BDH Printers, New Delhi, 1999, 380.
12. Sivarajan VV and Balachandran I. Ayurvedic Drugs and Their Plant Sources. Oxford and IBH Publishing Co. Pvt. Ltd., Oxford, 1994, 136.
13. Silja VP, Samitha Verma K, Mohanan KV, Ethnomedicinal plant knowledge of the Mullu Kuruma tribe of wayanad district, Kerala, Indian journal of Traditional knowledge, 2008; 7(4):604-612.
14. Warriar PK, Nambiar VPK, Ramankutty C. Indian Medicinal Plants: A Compendium of 500 Species, Orient Longman Ltd., Madras, 1995, 3, 285-286.
15. Komai K, Tang CH. Chemical constituents and inhibitory activities of essential oils from *Cyperus brevifolius* and *C. kyllingia*, Journal Chemical Ecology, 1989; 15:2171-2176.

16. Jusal P. Quanico, Evangeline C. Amor¹, and Grace G. Perez. Analgesic and Hypoglycemic Activities of *Bixa orellana*, *Kyllinga monocephala* and *Luffa acutangula*, Philippine Journal of Science, 2008; 137 (1):69-76.
17. Arumugam S, Ramadoss K, Vadivel V, Balasubramanian D and Muthu R. Evaluation of hepatoprotective activity of *Kyllinga nemoralis* (Hutch & Dalz) rhizomes, Journal of Ethnopharmacology, 2010; 127:555-557.
18. Sorachai Khamsan, Boonsom Liawruangrath, Saisunee Liawruangrath, Aphiwat Teerawutkulrag, Stephen G. Pyne and Mary J. Garson. Antimalarial, Anticancer, Antimicrobial Activities and Chemical Constituents of Essential Oil from the Aerial Parts of *Cyperus kyllingia* Endl, Records of Natural Products, 2011; 5(4):324-327.
19. Amor Evangeline C, Quanico Jusal P, Perez Grace G. Analgesic activity of extracts of *Kyllinga monocephala*, Pharmaceutical Biology, 2009; 47(7):624-627.