

A Concise Review on Ethnobotany, Phytochemistry and Pharmacology of Plant *Kyllinga Triceps* Rottb

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Abstract:

Kyllinga triceps rottb is a member of the Cyperaceae family and is one of the world's most widely distributed medicinal herbs. This review aims to look into the published report on ethnomedicinal, phytochemical and pharmacological activity, as well as the therapeutic potential of *Kyllinga triceps* rottb. An extensive literature is available in various recognized databases, including logical writing and scientific literature, as well as search engines such as Springerlink, ScienceDirect, SciFinder, PubMed, Scopus, Google Scholar, and BioMed Central, as well as relevant books, websites, scientific publications, and dissertations, was used to draft an up-to-date review. Phytochemical analysis of *Kyllinga triceps* species indicated the presence of essential phytochemicals like flavonoids, glycosides, alkaloids, phenolics, steroids, terpenoids, and tannins, the basis of its valuable therapeutic properties. The pharmacological activities exhibited by *Kyllinga triceps* rottb are antidiabetic, antimicrobial, antioxidant, hepatoprotective and antimicrobial, which are attributed to the presence of valuable bioactive phytoconstituents. Considering these facts, an attempt is made to give a thorough overview of ethnobotany, phytochemistry and the pharmacological activity of *Kyllinga triceps* rottb.

Keywords: *Kyllinga triceps* rottb; ethnobotany; pharmacological; phytochemicals

Introduction

A large amount of drug discovery research has been devoted to evaluating herbal medications to treat various illnesses and ailments (Ekor, 2014). Herbal medications, which have little or no adverse effects, play an important part in treating various illnesses. Because of drug resistance, traditional treatments are currently ineffective against several intended conditions (Puri, 2020). Furthermore, new illnesses are developing that pose a serious threat to the human species. Herbal medications have played an important role in creating a variety of therapeutically effective agents (Pan et al., 2013). India has a rich natural heritage source of ancient medical methods. From the standpoints of safety, efficacy, and quality, these traditional medical systems will stimulate the use of natural goods in healthcare (Ravishankar & Shukla, 2007). The Cyperaceae family comprises monocotyledonous flowering plants known as sedges, which look like grasses or rushes. The third-largest family with around 5,500 species is classified in 109 genera (Francis, 2009). These species are widespread, with the group's diversity centres located in tropical Asia and tropical South America (Raju et al., 2011). (Govindarajulu, 1969). *Kyllinga* is a genus of flowering plants from the Cyperaceae or sedge family, frequently referred to as spike sedges. The morphology of these

sedges varies, with heights ranging from 2 cm to a metre. (Bryson et al., 1997). *Kyllinga triceps*, synonym *Cyperus Kyllinga* Endl., belonging to the family Cyperaceae, is found throughout India and referred to as Nirvishaa, Nirbishi, and Mustaa. (Nadkarni, 2009). It is a tiny glabrous, erect plant with creeping rhizomes shown in Fig. 1. It is cultivated during July and October (Khare, 2007). It is a perennial plant that has been utilized in traditional folk medicine to treat a variety of ailments and problems. *Kyllinga triceps* Rottb. Is used as an antidote in many parts of India (Upadhyay et al., 2018b). *Kyllinga triceps* Rottb rhizomes are fragrant, aromatic, sweet, astringent, bitter, refrigerant, febrifuge, antidiarrheal, diuretic, stomachic, anthelmintic, expectorant, demulcent, and tonic. They are beneficial in pitta and vata vitiation, fever, cough, bronchitis, hepatopathy, plexopathy, diabetes, dermatitis, fistula, and tumours. (Upadhyay et al., 2018a) The tubers are fragrant, aromatic, sweet, astringent, bitter, refrigerant, diuretic, stomachic, anthelmintic, expectorant, sudorific, demulcent, and tonic. They are beneficial in pitta and Vata disorders such as hyperdipsia, fever, colonopathy, cough, bronchitis, hepatopathy, diabetes, and dermatitis. (Lal et al., 2012) *Kyllinga triceps* rottb thrives on wet fertile soil that is rarely farmed, as well as full sun. It may be found at elevations of up to 7000 feet. (Vanapatla et al., 2011). In several regions of India, the herb is utilized as

an antidote. (Paudel et al., 2012) Except for a few ethnomedicinal studies, much research has not been done on this plant. This review addressed the phytochemical and biological potential of *Kyllinga triceps* rottb.



Figure 1: Plant, flowers and Stems of *Kyllinga triceps* rottb.

Taxonomical classification (Kirtikar, 1991; Upadhyay et al.)

Kingdom:	Plantae
Clade:	Tracheophytes
Clade:	Angiosperms
Clade:	Monocots
Clade:	Commelinids
Order:	Poales
Family:	Cyperaceae
Genus:	<i>Kyllinga</i> Rottb.

Geographical Distribution

A capitate inflorescence distinguishes *Kyllinga* with compressed spikelets, rachilla disarticulating at the base, resulting in spikelets dropping off as a whole at maturity, two stigmas, and laterally compressed achenes (Patil & Prasad). It is natural sand-binding grass species (Venugopal et al., 2008) found in thick tufts in broad fallow fields on gravelly soils and between rock boulders (Ramana et al., 2012). The plant is found in India (Singh, 2016), Ceylon, Australia, Burma, China and the warm temperate zones countries (Bakshi, 1984). The plant is a prominent weed in improved pastures, but it also grows in crops, gardens, plantations, and roadsides (Govindarajulu, 1969). It thrives in wet, healthy soil that is rarely used farmed, as well as full sunlight. It may be found at elevations of up to 7000 feet. The plant is typically found in gardens and lawns. (Sankara-Rao et al., 2019; Shukla & Misra, 1979)

Ethnobotany

The rhizomes of plant *Kyllinga triceps* rottb are fragrant, aromatic, sweet, astringent, bitter, refrigerant, febrifuge, antidiarrhoeal, diuretic, stomachic, anthelmintic, expectorant, demulcent and tonic. (Rafat, 2019) The plant is used as an antidote in many parts of India. The root is a good refrigerant used in febrifuge and antidermatosis (Padmavathy & Anbarashan, 2011; Singh, 2016). The drug is also used in skin diseases and eye diseases. Chinese call *Kyllinga* "Shui wu gong" and use it for common colds, bronchitis, malaria, arthritis and injuries. *Kyllinga* is used for diarrhea in Malaysia and dysentery in China. *Kyllinga* is used in various places in Polynesia for joint pain and Rheumatic problems. The spikes are applied as poultices from gathered nails. A decoction of the rhizome is used as diuretic, demulcent and tonic. It is given to relieve thirst in fevers and diabetes. Mixed with oil, it is used as an application for dermatitis. It cures Kapha and pitta disorders, vomiting, indigestion, thirst, worm troubles, cough and bronchitis. The root is diuretic (in polyuria), demulcent, refrigerant and antipyretic. It is prescribed for

fistula, pustules, tumours, measles, diarrhea and other intestinal affections. Its root has been used as a diuretic (in polyuria), demulcent, antidermatosis, and antidiabetic. (Khare, 2007). The plant's fresh juice is applied typically to clean wounds, given the historic use of *Kyllinga triceps* (KT) roots in the treatment of diabetes. (Sharma, 2013). Diabetes is treated with a boiled extract of *Kyllinga triceps* in the Meitei and Meitei-pangal populations. (Khan & Yadava, 2010). The Oraon tribe administers whole plant paste (approximately 20 g) with a glass of goat milk as an antidote against snake poison (Mitra & Mukherjee, 2014; Vineeta et al., 2022). Skin injuries are treated with leaf juice (Das et al.). *Kyllinga* has therapeutic actions in Ayurveda, such as diuretic, stimulant, carminative, aphrodisiac, emmenagogue, astringent, and so on (Shiddamallayya et al., 2015).

Phytochemistry

Phytochemicals are potent compounds obtained from natural resources, particularly plants and have therapeutic activities (Bachar et al., 2020). Interestingly *Kyllinga triceps* species have been investigated for phytochemicals, and various phytoconstituents are isolated shown in Fig 2. Phytochemical screening of fresh leaves of *Kyllinga triceps* showed the presence of Alkaloids, Coumarins, Flavonoids, Glycosides, Lignins, Phenols, Steroids, Tannins and Terpenoids. (Babu & Savithamma, 2014) quercetin dihydrate rutin b-sitosterol and stigmasterol were isolated using column chromatography from *Kyllinga triceps* (Verma et al., 2017). Hydrodistillation was used to produce essential oil from the powdered rhizome of *Kyllinga triceps*, which was then analyzed by GC-MS and revealed Ferruginol's presence Caryophyllene, and Eudesmol. (Upadhyay et al., 2019). Methanol extract of shade-dried powder of *Kyllinga triceps* was analyzed using GC-MS analysis of a methanolic extract performed using a GC-MS. The GC-MS analysis provided different peaks which indicated presence of twenty two different phytochemicals namely Methanone, (1-hydroxycyclohexyl) phenyl – (14.88%), Tricyclo [4.2.1.1 (2,5)] dec-7-en-9-ol-(6.62%), n-deutero-3-ethyl-3-phenyl-2,6-dioxopiperidine-(5.19%), 2-Propenoic acid, 1,7,7-trimethylbicyclo[2.2.1]hept-2-yl ester, exo-(4.08 %), (E)-2-ethylidene-3-oxo-GA9 16á, 17-epoxide methyl ester (2.94%), Z)-4-chloro-2-methyl-1-phenylbut-3-en-1-one (2.05 %), (Aneela et al., 2014). The biological activities of the Cyperaceae family have been scientifically proved in vivo and in vitro and are linked to the high number of flavonoids and phenols found in these plants. (Bezerra et al., 2019)

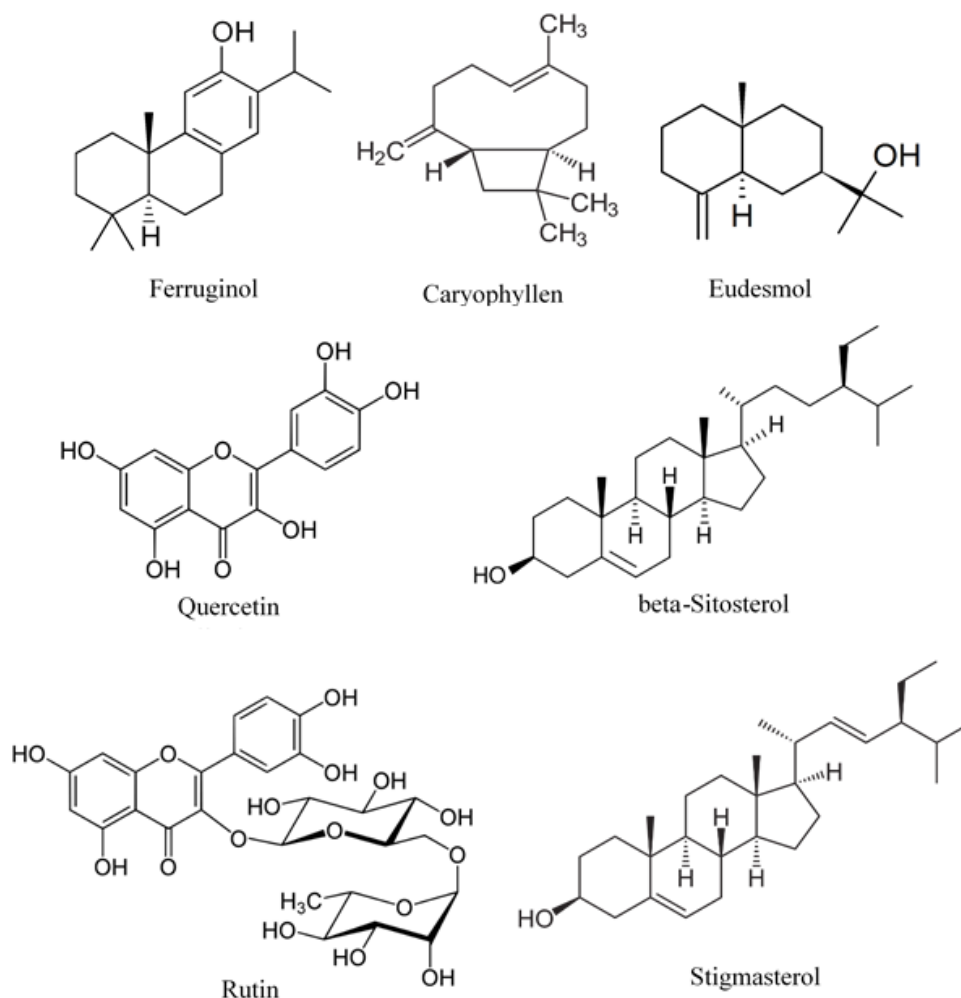


Figure 2: Phytoconstituents of *Kyllinga triceps*

Biological and Pharmacological Activities

Natural products have played a substantial part throughout the world in treating and averting human diseases (Puri, 2018). Interestingly, the *Kyllinga triceps* species include phytochemicals that have demonstrated pharmacological activities, as seen in Table 1. Decoction of roots is prescribed as an indigenous medicine to treat several disorders (Tirkey et al., 2019). The progress of these traditional systems of medicine in terms of safety, efficacy, and quality will support the preservation of the traditional legacy while also justifying the use of natural goods in

healthcare.(Puri Abhijeet et al., 2017). *Kyllinga triceps* are diuretic, stomachic, and anthelmintic herbs that can treat fistulas, pustules, tumours, stomach, and intestinal diseases (Kirtikar, 1991). Its tubers are used as a starter, febrifuge, and to cure death, rankles, bubbles, hack, the runs, aggravation, lacteal problem, arthritic joint inflammation, stomach illnesses, skin rashes, thirst, vomiting, worm invasion, and wounds(Shukla & Misra, 1979). Roots are prescribed for the treatment of diabetes.(Jain et al., 2006; Jain & Sharma, 1967). Leaf juices are recommended in Antidiabetes and dysentery(Ramya et al., 2019).

Sr. No	Part of plant	Activity reported	Reference
1.	Rhizome	Antidaoreal	(Rafat, 2019)
2.		Hepatoprotective	(Bachar et al., 2020; Upadhyay & Jain)
3.		Diuretic	(Upadhyay et al.)
4.	Roots	Febrifuge	(Padmavathy & Anbarashan, 2011)
5.		Antidiabetic	(Mondal et al., 2013; Swaroopa Rani & Nagamani, 2020; Vanapatla et al., 2011)
6.		Antidermatosis	(Khare, 2007)
7.	Leaves	Antidiabetic	(Sharma, 2013)
8.		Antibacterial	(Das et al.)
9.			(Verma et al., 2016)

		Anti-inflammatory activity	
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Table 1: Biological activities of *Kyllinga triceps***Antidiabetic activity**

Kyllinga triceps showed significant inhibitory activity against -amylase and -glucosidase. High TPC and TFC levels might be attributable to *Kyllinga triceps* exerting an enzyme inhibitory action, which can help limit glucose absorption and, as a result, glucose homeostasis. *Kyllinga triceps* might be suggested as a safe and effective therapy for postprandial hyperglycemia (Swaroop Rani & Nagamani, 2020). (Rani et al.) Investigated antidiabetic activity of *Kyllinga triceps* (KT) root extract fractions on streptozotocin-induced diabetes in rats. Diabetes was generated in elderly neonatal rats by a single intraperitoneal dose of Streptozotocin. The antihyperglycemic effect of root extract fractions was evaluated by monitoring fasting blood glucose levels in diabetic rats at particular intervals. The study's findings support the traditional use of *Kyllinga triceps* roots in the treatment of diabetes. Given the plant's traditional use in the treatment of diabetes, the hypoglycemic effect in Streptozotocin (STZ) induced diabetic rats was studied for 28 days. The diabetic rats were fed with *Kyllinga triceps* extract (KTE, 100mg/kg and 200mg/kg) and Glibenclamide (0.5mg/kg). Both treatments' effects on body weight and blood glucose levels were studied. In both acute and subacute studies, both extract and Glibenclamide dosages showed a considerable hypoglycemic effect. During the research period, the bodyweight of extract and glibenclamide treated rats remained constant, but the bodyweight of untreated rats decreased. The study's findings scientifically validated the folkloric usage of *Kyllinga triceps* as a hypoglycemic agent. As a result, the plant may play an important role in the treatment of diabetes (Lal et al., 2012). (Verma et al., 2013) determined antidiabetic activity of *Kyllinga triceps* methanolic extract separately in normal and streptozotocin-induced diabetic rats. Streptozotocin-activated diabetic rats were fed a 100 mg/kg methanolic concentration of *Kyllinga triceps* orally for 15 days. Fasting blood glucose levels and body weight changes in diabetic rats treated with methanolic extract were compared to controls, diabetic controls, and rats treated with conventional therapy. (Vanapatla et al., 2011) evaluated the antidiabetic activity of *Kyllinga triceps* was revealed in streptozotocin-induced diabetic rats. The study aimed to investigate if the root extract divisions of *Kyllingatriceps* had any antidiabetic activity in newborn mice when Streptozotocin was used to cause diabetes. A single intraperitoneal dose of Streptozotocin (90mg/kg) produced diabetes in neonatal rats. The antihyperglycemic effect of root extract components (toluene, ethyl acetic acid derivatives, and 1-butanol at 50 and 100 mg/kg.) was evaluated in diabetic rats by measuring fasting blood glucose levels at 0,2,4,6,8,12, and 24 hours after treatment. In upper east India, *Kyllinga triceps* was included as a natural antidiabetic medication after it was shown to be useful for the treatment of diabetes. This study focuses on possible hotspots for developing novel diabetes drug antagonists. (Mondal et al., 2013)

Hepatoprotective and Antioxidant activity

(Upadhyay & Jain) determined hepatoprotective and antioxidant effects of *Kyllinga triceps* rottb. Rhizome extract on ccl4-induced hepatotoxicity in rats. Hepatotoxic rats were treated with ethanol and pet. Ether extracts of *Kyllinga triceps* rhizome were administered orally at two doses each day. Serum marker enzymes such as SGOT, SGPT, ALP, and ACP, as well as total bilirubin (mg/100 ml) of blood, were measured to study the activities. Histopathological data verified all biochemical investigations compared to the conventional drug silymarin. The antioxidant activity of the plant rhizomes was assessed using SOD, catalase, glutathione peroxidase TBRARS, and the findings show that the plant rhizomes have

significant hepatoprotective and antioxidant effects that may be linked to the presence of terpenes and terpenoides.

Diuretic activity

(Upadhyay et al.) Evaluated Furosemide was utilized as a standard drug in their investigation of *Kyllinga triceps* rhizomes for their diuretic characteristics, and both petroleum ether and ethanolic extracts had substantial diuretic action. The effect of the extracts on water excretion was accompanied by an effect on urinary electrolyte excretion, as there appeared to be an increase in salt excretion when compared to the control group, supporting the idea that the diuretic effect was saluretic rather than aquaretic, which is a common feature of most phytodiuretic agents. The results reveal that the extracts increase sodium excretion more than potassium excretion, which is a highly favourable diuretic safety profile because hypokalemia is one of the potential adverse effects of synthetic diuretics like Furosemide. When the urine pH was measured, the extracts showed a relative rise in pH values compared to controls, supporting the concept that carbonic anhydrase inhibition is one of the plant's possible mechanisms of action. Furthermore, reducing potassium excretion at the highest doses of the extracts and the resultant alkalinization of urine may suggest that the plant might operate as a small potassium-saving diuretic.

Anti-inflammatory activity

(Verma et al., 2016) studied the anti-inflammatory activity of methanolic extract of *Kyllinga triceps* rottb. Here pain alleviating and antipyretic activities of methanolic concentrate of *Kyllinga triceps* at various concentrations were investigated using a hot plate, acidic corrosive induced wriggling, and yeast induced hyperthermia approach. *Kyllinga triceps* showed significant pain-reducing, and antipyretic workouts in all models studied. The findings support the plant's traditional use in treating agony and fever.

Conclusion

The review's goal was to highlight recent advancements in the phytochemical and pharmacological research of *Kyllinga triceps* as a prognostic therapeutic agent. According to the literature review, the species has pharmacological properties such as antioxidant, antidiabetic, anti-inflammatory, antipyretic, and antibacterial activity. Flavonoids, flavonols, proanthocyanidins, total phenols, tannins and alkaloids may be useful as a starting point for the creation of novel medications to treat a variety of ailments. Various pharmacological and ethnomedicinal qualities discovered in diverse studies may be valuable in creating innovative drugs. As a result, intensive pharmacological and phytochemical analyses, experiments, and pharmacokinetic and toxicological investigations can focus on future research on *Kyllinga triceps*. This review paper focuses on the potential of *Kyllinga triceps* for use in novel therapeutic pharmaceuticals and will serve as a foundation for future studies on the use of herbal medicines.

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