NJESR/July2025/Volume-7/Issue-7 E-ISSN-2582-5836
DOI-10.53571/NJESR.2025.7.7.62-69

Evaluation Of Antimicrobial Properties And Phytochemical Constituents Of *Nagarmotha* Plant : A Review

Anita Rai
Department Of Chemistry
PPN PG College
Kanpur
UP
India
Email id: raianita19@gmail.com

(Received-15-June-2025/Revised-30-June-2025/Accepted-10-July-2025/Published-30-July-2025)

Abstract

The purpose of this study was to assess Cs antimicrobial activity. rotundus rhizomes tuber leaves and oil against three types of fungi and a number of bacteria.The antimicrobial activity of crude aqueous and ethanolic extracts was investigated using the agar well diffusion method and inoculating bacteria and fungi on media containing plant extract. By measuring the inhibition zone and assessing microbial growth the study demonstrated the impact of plants. The ability to inhibit E growth was demonstrated by the aqueous extract of leaves. coli and rhizome-tuber extracts both ethanolic and aqueous demonstrated antibacterial activity against S. aureus and E. coli in a positive way. Additionally all of the chosen fungi and bacteria were susceptible to rhizometuber ethanolic extract with varying inhibition zones. With the exception of Cyperus oil had no possible inhibitory effect on bacteria or fungi. albicans. Eleven secondary metabolites were found by using phytochemical screening for rhizome-tuber extracts.

Keywords : Cyperus rotundus, Antimicrobial Activity, Aqueous And Ethanolic Extracts, Agar Well Diffusion Method, Inhibition Zone, Phytochemical Screening

Introduction

Crude whole plant of C. has antimicrobial properties. According to Prasad (2014) rotundus is effective against certain clinical isolates of bacteria. The World Health Organization states that plants with a clinical aspect are the best option for producing drugs. In order to use herbs as antimicrobial agents against infectious diseases modern mechanisms are constantly employed to identify their chemical structures. L. Cyperus rotundus. is a common perennial weed that is a member of the Cyperaceae family. It is known by a variety of dialect names

and synonyms in Iraq it is called Soad or Al Saad in other places it is called Nut grass Nagarmotha Nutsedge Purple Nutsedge and other names. The rhizome of this plant is cylindrical scaly creeping bulbous at the base and arises singly from the tubers. It has a distinctive smell and appears blackish on the outside and reddish white inside. Sivapalan 2013. Peerzada et al. (2014). (2015)). In the area C. Rotundus is used as a decoction in traditional medicine to treat flatulence nausea vomiting hormone regulation (prolactin) tonic hypoglycemia and diuresis (Naqishbandi 2014). Allelochemicals such as polyphenols are present in the purple nutsedge flavonol glycoside saponin and sesquiterpenes. Through allelopathic effects and competition for growth factors the plant lowers crop productivity and quality. Additionally other researchers came to the conclusion that C. rotundus influences crops through competition allelopathy and acting as a substitute host for pathogens and insects. Particularly in Southeast Asia and the Middle East leaves were used to flavor food. Additionally the seeds are used to pickle and transport spices and baked goods. Additionally the rhizomes and tubers of C have been used to make some kinds of perfume. For centuries rotundus was utilized in Arab nations Africa China and India as a spice and in Ayurvedic treatments. According to Kilani et al. they have antidiarrheal anti-oxidant anti-inflammatory anti-mutagenic anti-periodic anticonvulsant anti-saturative anti-pyretic antifungal antidiabetic antimalarial antilipidemic antibacterial antiviral anti-tumoral cardioprotective and wound-healing qualities.. Spasms diarrhea dysmenorrhea and irregular menstruation have long been treated with its tubers as a natural remedy (Al-Massarani et al. [2016]. The tubers and rhizomes of C date back to ancient times. In a number of nations including China India Iran and Japan rotundus has long been used as a herbal remedy to treat stomach and bowel issues (Al-Massarani et al. and 2016). Additionally in an antimicrobial study on C. rhizomes. rotundus they discovered that while all extracts were ineffective against fungal strains the ethanolic extract showed the strongest activity against tested bacteria. The tubers and rhizomes of C were found to contain a variety of phytochemicals including flavonoids alkaloids cyperol fatty oils furochromones glycerol linolenic acid myristic acid nootkatone starch saponins sesqui-terpenes sitosterol stearic acid terpenoids polyphenol and novel sesquiterpenoids. (Sivapalan 2013 Himaja et al. (2014) Peerzada et al. [2015]. These substances are what give C its medicinal fungicidal insecticidal and pesticidal qualities. rotundus.The purpose of this study was to examine the antibacterial and antifungal properties of Cs rhizomes tubers leaves and oil. rotundus which may be utilized as novel antimicrobial

agents and improve the management of infectious diseases by combating pathogenic isolates of bacteria and fungi.

Experimental

Plant extract preparation is the first step. Plants of C . rotundus were gathered . After being dried in the shade the plant was ground into a fine powder using an electrical grinder. Two separate powders of rhizomes tubers and leaves weighing 50 grams each were extracted one using 250 milliliters of 70 percent ethanol and the other with 250 milliliters of distilled water. Each mixture was shaken for a full day. After that the extracts were filtered dried and weighed to establish the 500 mg/ml concentration needed to prepare the stock solution. Moreover the C. We bought rotundus oil from the local market.

tiny organisms. Plant extracts were shown to have antimicrobial potential using a number of clinical isolates of bacteria and fungi. Escherichia coli Pseudomonas aeruginosa Staphylococcus aureus Bacillus cereus Klebsiella pneumoniae and Proteus mirabilis were among the bacteria Candida albicans Candida tropicalis and Aspergillus niger were among the fungi. To activate them they were first inoculated into broth media and incubated for the entire night. In order to demonstrate the antimicrobial potential of extracts and microbial susceptibility to performed extracts the concentration of microorganisms in broth media was optimized and cultured on media.

Media Preparation

A variety of media were prepared for this study including peptone water to activate microorganisms Mueller Hinton agar as a selective medium for testing antimicrobial susceptibility and Sabouraud Dextrose Agar (SDA) which was also established for fungal growth and the estimation of suppressed fungi by plant extract.

Antimicrobial Susceptibility Test

Two methods were used for this test: cultivating bacteria and fungi on nutrient agar and SDA media enhanced by one milliliter of plant extracts. The most popular technique for determining a microorganisms susceptibility to antimicrobial agents is agar well diffusion which involves inoculating 0. 4 ml of extracts into 12 mm-diameter wells

Phytochemical Screening

Eleven secondary metabolites were identified by phytochemical screening in ethanolic and aqueous extracts of the plants rhizomes and tubers. For particular secondary metabolites a variety of reagents including Wagners reagent Kelnar-kiliani sodium hydroxide ferric chloride hydrochloric acid and ethanolic acetic acid were employed.

Result And Discussion

The Cyperus rotundus plants rhizomes tubers leaves and oil were extracted and used as antibacterial and antifungal agents against three different species of fungi and six pathogenic isolated bacteria. A C. Rotundus is thought to be a promising plant because it has antimicrobial activity against a variety of microorganism-caused illnesses including skin stomach diarrhea and dysentery. (C). Rotundus in ethanol and aqueous extracts were used to randomly grow microbes on media enriched with 1% extract and agar well diffusion method by inoculating 0. 4 ml/well. Both aqueous and ethanolic extracts of rhizomes and tubers had antibacterial activity on E according to the growth of targeted microorganisms on enriched medium by plant extract. S. aureus and coli but only ethanol extract showed antifungal activity against A. Nigerian. Regarding leaf extract only E. Aqueous extract was effective against coli but ethanolic extract had no effect on microbes. As well C. Rotundus oil showed promise as an antifungal agent against C. albicans and no antimicrobial activity against other microorganisms as indicated in Tables 1 and 2.

Table 1 shows the antibacterial activity of Cs oil leaves and rhizomes. rotundus. + denotes effectiveness and - denotes ineffectiveness.

Table 1: Anti-bacterial activity of rhizomes-tubers, leaf and oil of C. *rotundus*

Extract / Bacteria	Rhizome D.W	Rhizome Ethanol	Leaf D.W	Leaf Ethanol	Cyperus Oil
S. aureus	++	++	-	-	**None**
E. coli	++	+	+	-	**None**
B. cereus	-	-	-	-	**None**
P. aeruginosa	-	-	-	-	**None**
p. mirabilis	-	-	-	-	**None**

Table 2: Antifungal activity of rhizome-tuber, leave and oil extracts *C. rotundus*

Extract / Fungi	Rhizome D.W	Rhizome Ethanol	Leaf D.W	Leaf Ethanol	Cyperus Oil
C. albicans	-	-	-	-	++
A. niger	-	++	-	-	-

Both types of rhizome extract were applied to Mueller Hinton agar using the agar well diffusion method. The promised portion of C is assessed using rhizome and tuber extract. rotundus because the most important secondary metabolites are present (Himaja et al. [2014].

The rhizomes ethanolic extract demonstrated broad-spectrum antimicrobial activity whereas the aqueous extract showed no activity. Plant extracts have far more microbial activity in organic solvents than in water. Bacillus cereuss inhibition zones were 35 mm Ps were 34 mm 33 mm and 27 mm. aeruginosa S. aureus and K. pneumoniae in turn. Additionally it was 26 mm for C. albicans while C is 25 mm. Tropicis. Our findings showed that bacteria in capsules (K. Fungi are more resistant to antimicrobial agents than bacteria and pneumoniae is less susceptible than other non-capsulated bacteria. The susceptibility of bacteria and fungi after 48 hours was the same as that of the previous 24 hours with the exception of P. The inhibition zone was reported at 24 and 48 hours of incubation. aeruginosa which changed from 34 to 37 mm after 48 hours as shown in (Table). (3). A.

Table 3: Antimicrobial activity of rhizome-tuber extracts

Extract / Bacteria	Rhizome D.W/mm at 24hrs.	Rhizome Ethanol/mm at 24hrs.
S. aureus	-	33
E. coli	-	-
Bacillus sp.	-	35
P. aeruginosa	-	34
p. mirabilis	-	-
K. pneumonia	-	27
C. albicans	-	25
C. tropicals	-	26

- : No effect

This study supports Kabbashi et al. s findings. (2015) who came to the conclusion that Cs whole extract had high activity. Rotundus displayed (31 and 30 mm) in opposition to (S. aureus and B. subtilis) as well as (20 & 26 mm) against (A). C. & Niger. albicans. Additionally it displayed (19 & 20 mm) against (E). coli as well as P. aeruginosa. Eleven different kinds of chemical components in the ethanolic and aqueous rhizome of C were screened for phytochemicals. rotundus through particular testing. Consequently the aqueous and ethanol extracts contained six phytochemicals: alkaloids phenols phlobatannins saponins terpenoids and tannins. However only cardiac glycosides were found in the ethanolic extract and flavanoids in the aqueous extract sterols quinones and oxalates were not found in the plant extracts (Table 4).

Conclusions

Because of the presence of secondary metabolites rhizomes and tubers together exhibited the strongest antibacterial and antifungal activity in this study. Water extracts were less effective than ethanolic extracts. Additionally bacteria were shown to be more vulnerable to the plant extracts than fungi. With the exception of P all bacterial and fungal inhibitory effects were identical after 24 and 48 hours of incubation. aeruginosa which was still more impacted a day later. To identify the primary elements responsible for the antimicrobial activity of C . rotundus extracts more research is required.

Table 4: Phytochemical screening of secondary metabolites from rhizome of *C. rotundus*

Phytochemical compound	**Test**	**Observation**	**Aqueous extract**	**Ethanolic extract**
Alkaloids	Wagner, (Kage etal., 2009)	Red/brown precipitate	+	+
Cardiac glycosides	Kelnar-kiliani, (Dugger 2002)	Brown & violate ring	-	+
Flavonoids	Alkaline reagent (NaOH) (Dugger, 2002)	Yellow to colorless	+	-
Phenols	Ferric chloride (Mutalib, 2015)	Deep blue to black	+	+
Phlobatannins	Precipitate (Sydor etal., 2006)	Red	+	+
Saponins	Foam(Aharoni etal 2005)	Foam formation	+	+
Sterols	Liermannn-Bercard (Dugger, 2002)	Dark pink	-	-
Tannins	Braymer (Mutalib, 2015)	Blue to greenish	+	+
Terpenoids	Salkowaski (Aharoni etal	Reddishbrown precipitate	+	+

	2005)			
Quinones	HCl(Sydor etal., 2006)	Yellow precipitate	-	-
Oxalate	Eth. Acitic acid (Sydor etal., 2006)	Greenish black	-	-

'+': Present '-': Absent

References

1. Al-Massarani, S., Al-Enzi, F., Al-Tamimi, M., Al-Jomaiah, N., Al-amri, R., Başer, K. H. C., ... & Demirci, B. (2016). Composition & biological activity of Cyperus rotundus L. tuber volatiles from Saudi Arabia. *Natural Volatiles & Essential Oils*, *3*(2).
URL- https://www.nveo.org/index.php/journal/article/view/37

2. Bown, D. (1995). *Encyclopaedia of Herbs and their Uses.* London:Dorling Kindersley.

3. Dugger, H. (2002). *U.S. Patent Application No. 10/230,075*.

4. Himaja, N., Anitha, K. Joshna, A., & Pooja, M. (2014). Review article on health benefits of*Cyperus rotundus*. *Indian Journal of Drugs*, 2(4), 136-141. URL - https://www.researchgate.net/publication/376238696_Review_article_on_health_benefits_of_Cyperus_routendus_Indian_journal_of_drugs

5. Kabbashi, A. S., Mohammed, S. E. A., Almagboul, A. Z., & Ahmed, I. F. (2015). Antimicrobial activity and cytotoxicity of ethanolic extract of Cyperus rotundus L. *American Journal of Pharmacy and Pharmaceutical Sciences*, *2*(1), 1-13, URL - https://www.researchgate.net/publication/281064573_Antimicrobial_activity_and_Cytotoxicity_of_Ethanolic_Extract_of_Cyperus_rotundus_L#:~:text=bromide%20(MTT).-,The%20ethanol%20extract%20of%20C.,Gram%2Dpositive%20against%20bacteria%20S

6. Mutalib, L. Y. (2015). Comparative physicochemical, phytochemical and biological study of botanically related species from Brassicaceae family grown in Kurdistan Region, Iraq. *Asian Journal of Research in Pharmaceutical Science*, *5*(3), 168-174, doi- 10.5958/2231-5659.2015.00025.9

7. Naqishbandi, A. (2014). Plants used in Iraqi traditional medicine in Erbil-Kurdistan region. *Zanco Journal Medical Science*, *18*(3), 811-815, doi- http://dx.doi.org/10.15218/zjms.2014.0038

8. Peerzada, A. M., Ali, H. H., Naeem, M., Latif, A. H. B. & Tanveer, A. (2015). *Cyperus rotundus* L.: Traditionaluses, phytochemistry and pharmacological activities. *Journal of Ethnopharmacology,* 174, 540-560, doi- 10.1016/j.jep.2015.08.012

9. Prasad,M.P.(2014).Analysis of antimicrobial compounds in *Cyperus rotundus* and*Azadirachta indica* against human pathogen. *International.Journal of Current.Microbiol.Applied.Science,* 3(3), 206-210. URL- https://share.google/a6UpF2LeDEhhPmXyd

10. Muneesh Kumar etal.(2017) Review on Pharmacology and Phytochemistry of Cyperus rotundusL. Current Research in Pharmaceutical Sciences, 07(01), 11-15.DOI - 10.24092/CRPS.2017.0701012

11. Vijender Singh et al (2018). Analysis and antimicrobial activity of the essential oil of Cyperus rotundus L. rhizomes. Journal of Medicinal Plants Studies, 6(5), 101-105.URL- https://share.google/Nu7MVMd75D5O0I6H1

12. Yasaman Taheri et al (2021). Cyperus spp.: A Review on Phytochemical Composition, Biological Activity, and Health – Promoting Effects. Oxidative Medicine and Cellular Longevity, volume 2021, 1-17. DOI : 10.1155/2021/4014867