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Research Paper

# Chemical Composition and Antifungal Activity of Essential Oil of Tubers of Cyperus Rotundus Linn. Collected From Kannauj (U.P.)

Chemistry

**KEYWORDS :** Cyperus rotundus, tubers, hydrodistillation, Antifungal activity, GC-MS.

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## ABSTRACT

*Cyperus rotundus, a cosmopolitan weed, is found in all tropical, subtropical and temperate regions of the world. The essential oil (0.2%) was extracted by hydrodistillation from the tubers of Cyperus rotundus collected from Kannauj (Uttar Pradesh). After hydrodistillation oil was subjected to GC-MS analysis. The oil was screened for its antifungal potential. The oil was found to be effective against various fungal strains viz. Sporothrix schenckii and Candida albicans in different concentrations.*

**INTRODUCTION :**

*Cyperus rotundus Linn* (Nutgrass) belongs to the family cyperacea. It is commonly known as *Nagarmotha*. It is pestiferous perennial with dark green glabrous culms, arising from underground tubers.[1]

Essential oils are secondary metabolites of various parts of plants.[13] Essential oil extracted from plants have unique therapeutic benefits. These are utilised in various forms such as ointment, lubricant, lotions, perfumes massage and incense.[2, 3] Research studies have shown that it possesses various pharmacological activities such as diuretic, carminative, emmenagogue, anthelminthic, analgesic, antinflammatory, antidysentric, antirheumatic activities.

The flavonoids, terpenoids and mono sesquiterpenes are the major components of *Cyperus rotundus*. The essential oil of *C. rotundus* was mainly composed of cyperol, α-cyperene and α-pinene, rotundine, β-pinene, myrtenol, α-Cyperene and sesquiterpene hydrocarbon. Antifungal action of essential oil is due to the presence of active compounds that can inhibit fungal growth.

The tubers have many medicinal uses. The tubers are refrignant, demulcent and tonic.[10] Romans used the tubers as emmenagogue in uterine complaints.[4] Decoction of dried root is taken orally for colic, to treat diarrhea.[8] Tubers and rhizomes, crushed and boiled in goat's milk are taken orally for colic to treat diarrhea, to treat vomiting in children.[2] Dried tuberous roots, known as source of aromatics.

The essential oil of rhizome of *Cyperus rotundus* collected from South India[6] contained α-copaene (11.4% - 12.1%) Cyperene (8.4-11.7%) Valerenal (8.7-9.8%), Caryophyllene Oxide (7.8-9.7%).[6] Samples collected from two different locations of South Africa[9] contained cyperone (7.9-11.0%) myrtenol (7.9-7.1%) caryophyllene oxide (5.4%), α-pinene (10.8%) and β-Pinene (5.3-11.3%).

Although work have been carried out on the chemical composition of the oils of *Cyperus rotundus*.[5, 6, 7, 8, 9] The present study shows the chemical composition of the essential oil of *Cyperus rotundus* from Kannauj (U.P.) and their antifungal activity.

**MATERIALS AND METHODS :**

The fresh tuber root of *Cyperus rotundus* were collected from Kannauj (U.P.). The fresh tubers (250g) were hydrodistilled for 6-7 hrs. using clavenger apparatus. The oil so obtained was extracted with ether and dried over anhydrous $Na_2SO_4$ and ethereal layer was finally evaporated at room temperature.

Oil was light yellow in colour and was having characteristic smell. When exposed to atmosphere it gets volatized. It was soluble in ether.

The extracted essential oil was subjected to GC-MS analysis (Table 1). This was carried out on a PERKIN ELMER CLARUS - 500 model coupled with CLARUS-500 mass spectrometer with 0.1 µl in the split mode. Helium as a carrier gas at a flow rate of 1ml/min. inlet temperature were 210°C. Oven temp. was held at 60°C to 220°C for 10 minutes followed by linear temperature programming at the rate of 3° temperature rise per minute. The column was coupled directly to the Perkin Elmer Clarus Mass spectrometer. This spectrometer is operated in the electron ionization mode at 70 eV, ion source temperature 150°C. Identification of mass spectra were made by matching the mass against the NIST library software and Retention time comparison with the publisher data of Wiley.

The essential oil of *Cyperus rotundus* was screened for its antifungal activity against various fungal strains viz. *Sporothrix schenckii* and *Candida albicans*. The antifungal activity was determined by Agar disc diffusion method. The fungal strain taken for the study. 0.1 ml of fungal strains were swabbed over the agar plates. Petriplates were allowed to dry. With the help of sterilized forceps sterilized paper disc were placed over agar surface at equidistant and an aliquot of 10 µl of different concentration and each were soaked on to the sterile filter paper disc for determination of Minimal Inhibitory Concentration (MIC). The petriplates were incubated at 25°C±1°C for 70 hrs. and inhibition zone diameter were recorded. Nystatin was as standard antifungal antibiotic (10 µl of 100 µg/ml stock solution).

**RESULT AND DISCUSSION :**

The colour of essential oil of *Cyperus rotundus* tuber after hydrodistillation dark yellow colour. The specific gravity and refractive index was 0.8424 and 1.454 respectively. After the GCMS analysis the essential oil of *Cyperus rotundus* near about Seventeen compounds indentified (Table 1). The major components were *5-oxo-isolongifolene* (18.268%), α-*gurjunene* (15.218%), *(Z)-valerenylacetate* (7.878%), and α-*salinene* (5.480%). The minor components were α-*pinene,* β-*pinene, cyperol, rotundine* etc. mentioned in table 1.

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At different concentration the oil of *Cyperus rotundus* shown good activity against *Sporothrix schenckii* and *Candida albicans*(Table 2 ).

**CONCLUSION :**

The major components of essential oil of *Cyperus rotundus* tubers collected from Kannauj (Uttar Pradesh) by GC-MS analysis were *5-oxo-isolongifolene,* Cyprotene, acopaene, decadiene, α-*pinene,* β-*pinene, Caryophylleneoxide,* (Z) valerenyl acetate etc. The oil composition of *Cyperus rotundus*, obtained from Kannauj (Uttar Pradesh) was different from south region.

The oil was effective against fungus *Sporothric schenckii* and *Candida albicans.* The compositional difference between *C. rotundus* found in Kannauj due to the climatic and environmental conditions. This shows the existence of more chemical diversity within the *C. rotundus* species.

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**Table 1 : Percentage composition of *Cyperus rotundus Linn*. oil sample**

| S.No. | Identified compounds | Percentage |
|---|---|---|
| 1. | *5-oxo-isolongifolene* | 18.268 |
| 2. | α-*gurjunene* | 15.218 |
| 3. | (Z)-valerenylacetate | 7.878 |
| 4. | α-*salinene* | 5.480 |
| 5. | α-Pinene | 4.246 |
| 6. | β-pinene | 4.218 |
| 7. | Cyperol | 3.660 |
| 8. | Rotundine | 3.400 |
| 9. | Cyprotene | 2.818 |
| 10. | Cyperene | 2.815 |
| 11. | Valencene | 2.925 |
| 12. | Decadiene | 1.3247 |
| 13. | Acopaene | 1.325 |
| 14. | 1, 8-Cineole | 3.241 |
| 15. | Cis-α- Copane - 8 - ol | 2.911 |
| 16. | Myrtenol | 5.924 |
| 17. | Caryophyllene oxide | 1.215 |

**Table 2 : Antifungal activity of essential oil of *Cyperus rotundus* Linn. through Disc Diffusion A.**

| S. No. | Fungal strain | Zone of growth inhibition in mm by the sample | | | | |
|---|---|---|---|---|---|---|
| | | Concentration showing inhibition zone diameter mm | | | | |
| | | 100% | 50% | 25% | 0.25% | Nystamin 100 µg/disc |
| 1. | Sporothsix schenckii | 7 | - | - | - | 12 |
| 2. | Candida albicans | 5 | 2 | - | - | 10 |

(-) = No inhibition of fungal growth.

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