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website:- www.journalofchemistry.org**Study of the phytochemical constituents and antibacterial activity against gram positive and gram negative bacteria of the rhizome oil of *Hedychium Spicatum* (Kapoor Kacchri)**

SHASHI AGARWAL*, ALKA SRIVASTAVA, RACHNA PRAKASH and RASHMI MOHAN MATHUR

Department of Chemistry, Dayanand Girls P.G. College, Kanpur (U.P.) India

Corresponding Author Email:- shashi.agrwl@gmail.com<http://dx.doi.org/10.22147/juc/130303>

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Abstract

Hedychium Spicatum (Kapoor Kacchri) is a vigorous tall growing ginger and consist multiple stem per pot. The underground part rhizome is useful in preparation of indigenous medicine. The crude extract of rhizome has been used in preparation of anticancerous drug. In addition to its medicinal values, the plant rhizome is reported to posses anti inflammatory, hypoglycaemic, vasodialator and hypotensive properties as well as antibacterial activity against both gram positive and gram negative bacteria. The major chemical constituents are limonene, cineole, terpinene, linalool, p-cymene, terpenol and phellandrene.

Key words: Indigenous medicine, anticancerous drug, antibacterial activity, phellandrene, anti inflammatory.

Introduction

Plants are used as a rich source of medicine since ancient time. *H. spicatum* commonly known as Kapoor Katcheri or Ginger lilly. It grows well in moist soil, sunny position and wide range of climatic conditions of forest margins^{1,2}. Traditionally the rhizomes are used tranquiliser, hypotensive, antispasmodic analgesic, anti inflammatory, antimicrobial, antioxidant, antifungal, pediculicidal, cytotoxic and in respiratory disorders³⁻⁷.

The rhizome oil contains starch, resins, organic acids, glycosides, albumen and saccharides which is administered for blood purification, bronchitis, indigestion, treatment of eye disease and inflammation⁸. Chemically, the rhizome is reported to contain sitosterol and its glucosides, furanoidditerpene-hedychenone and

7-hydroxyhedychenone. The major chemical constituents present in Kappor Katcheri essential oil are limonene, cineole, terpinene, linalool, p-cymene, terpenol and phellandrene⁹.

In addition to its medicinal values, the plant rhizome is also reported to possess antiinflammatory, hypoglycaemic, vasodialator, spasmolytic, antiasthmatic and hypotensive properties as well as antibacterial activity against both Gram-positive and Gram-negative bacteria^{10,11,12}. The present study reveals that the study of antibacterial activity in the rhizome oil of *Hedychium spicatum* against *Bacillus subtilis* and *Pseudomonas aeruginosa*.

Experimental**Sample preparation :**

Firstly fresh rhizomes of *Hedychium spicatum*

(Kapoor Kacheri) were cut into small pieces and then oil is extracted by the process of steam distillation. The oil was transferred into a stoppered tube, dried over anhydrous sodium sulphate and then stored in refrigerator at 4°C until analyzed.

GC-MS Analysis :

GC-MS analysis was carried out using Perkin Elmer Clarus 500 model couples with CLARUS-500 mass spectrometer with a RTX-5 column (6 m x 0.32 mm x 0.25 µm). Injection volume was 0.1 µl in the split mode (split flow 50 ml/minutes). Helium as a carrier gas at a flow rate of 3° temp rise/minute. The column was coupled directly to the Perkin Elmer Clarus mass spectrometer operated in the electron ionization mode of 70 ev, ion source temperature 150°C. The constituents of the oil were identified by comparison of their mass spectra with those of the computer library search (NIST/PFLEGER/WILEY) and confirmed by comparison of their retention indices either those of authentic compounds or with data published in the literature.

Antibacterial Analysis :

Antibacterial activity of rhizome oil of *Hedychium spicatum* (Kapoor Kachchri) was tested by the disc agar diffusion method. The bacterial strains used in the study were Gram positive *Bacillus subtilis* and Gram negative

Pseudomonas aeruginosa. The tested strains are reference strains and were collected from CDRI Lucknow.

The bacteria were grown on the Mueller-Hinton agar medium (pH7.2-7.4). Microbial suspensions were then made from the agar plates using relevant broths. The discs (5 mm in diameter) were impregnated with 10 ml of rhizome oil, followed by air drying and were placed on seeded agar plates. Streptomycin was used as positive control to determine the sensitivity of bacterial strain. The plates were incubated at 36°C for 24 h and the observed zones of inhibition were measured.

Result and Discussion

Steam distillation of fresh rhizomes of *H. spicatum* (Kapoor Kacheri) afforded a pleasant smelling, pale yellow coloured oil. Table 1 shows the rhizomes oil components whose identity was established by GC-MS analysis, literature data and by relative indices. The analysed oil contained monoterpene hydrocarbons, oxygenated monoterpenes, sesquiterpene hydrocarbons and orxygenated sequiterpenes.

The major constituents were camphene, β-pinene, P-cymene, α-phellandrene, 1, 8-cineole, Limonene, Linalool, Fenchol, Borneol, Terpinene-4-ol, α_Terpineol, α-Selinene, Selina-3, 7 (11)-diene.

Table-1

Components	Retention time	Concentration (%)	RRI
Camphene	3.36	1.4	953
b-pinene	3.86	3.90	990
P-cymene	3.96	8.18	1020
a - phellandrene	4.23	0.11	1007
1, 8-Ceneole	4.58	12.41	1028
Limonene	4.78	0.63	1025
Linalool	5.98	60.26	1098
Fenchol	7.15	0.17	1130
Borneol	8.75	0.89	1162
Terpinene-4-ol	8.96	1.09	1150
a-Terpineol	8.97	2.48	1165
a-Selinene	19.70	0.32	1464
Selina-3,7 (11)-diene	21.98	0.21	1480

RRI – Relative retention index

The result of the antibacterial studies of the rhizome oil obtained by disc diffusion method are given in table II. A concentration of 20 µl of rhizome oil showed nearly equal and effective inhibition against the bacterial strains used in the present study. The most susceptible bacterium tested was *P. aeruginosa* with a zone of inhibition of 10mm. The results also showed that the rhizome oil was

found to be more effective antibacterial agent than the standard antibiotic streptomycin 2 µg per disc used in the study. Moreover the rhizome oil inhibit the growth of both Gram positive (*Bacillus subtilis*) and Gram negative (*Pseudomonas aeruginosa*) bacteria. The results of the anti bacterial studies of the rhizome oil obtained by the disc diffusion technique are given in Table 2.

Table 2

Sl. No.	Test Bacteria	Diameter of inhibition zone (mm)	
		Rhizome oil	Streptomycin
1.	Bacillus subtilis (+)	08	20
2.	Pseudomonas aeruginosa (-)	10	08

Gram Positive (+)

Gram negative (-)

Conclusion

Hedychium spicatum is a one of popular medicinal plant. Due to its high medicinal properties rhizome oil is used in making various types of drugs including anticancerous drugs. Preliminary anti bacterial studies has shown that the oil has modest activity against Gram positive and Gram negative bacteria.

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