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Antimicrobial Properties and Pharmacological Importance of Hedychium coronarium

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ABSTRACT

Hedychium coronarium is a plant that has been supported to contain pharmacological properties; this study tests on the cell reinforcement and antimicrobial properties of the plant extricates. It was evident that the aeriform of the plant rhizomes had a higher antioxidant activity at 0. 44 µg/g than the oils at 0. 007 µg/g, although the leaching contained twofold total phenol than the oils. This means that aqueous extraction is more efficient in obtaining better antioxidants compared to essential oil extraction. In the antimicrobial suitability tests, it gave moderate activity against the Staphylococcus aureus (15mm) and Corynebacterium diphtheriae (17mm) but was inactive against Escherichia coli or Salmonella typhi therefore giving an indication of its strain specificity. Moreover, combined works indicated that the oil raised the potency of Amikacin, Gentamicin and Vancomycin against the E. coli since the zones of inhibition improved dramatically when the bacteria was incubated with the antibiotics and the oil— from 23 mm to 26 mm. 50 mg with Gentamicin, 75 mg with Amikacin, from 20. 5 mm to 28. From 0 mm to 75 mm with Gentamicin, and from 0 mm to 11 mm and with . 75 mm with Vancomycin. Thus, no synergistic effect was observed regarding Tetracycline, which showed that the interaction with one type of antibiotics could be quite different from the interaction with another one. These results also clearly suggest that Hedychium coronarium essential oil can be used as an adjuvant in antimicrobial treatment.

Keywords: Hedychium coronarium, Antimicrobial, Pharmacological, Bioactive, Therapeutic.

I. INTRODUCTION

Hedychium coronarium is an ever green flowering plant commonly known as white ginger lily, found chiefly in Southeast Asia. Known for its aesthetic value and unique aroma, this plant has recently attracted a lot of interest as a source of pharmacologically active compounds, especially those that can inhibit microbial growth. This strategy of evaluation and assessment seeks to look at Hedychium coronarium from traditional use point of view up to scientific evidence today in the area of antimicrobial. The use of Hedychium coronarium in medicinal system has been practiced in the Southeast Asian region and South India. It has been utilized for its antimicrobial, anti-inflammatory and analgesic effects for the conditions such as skin infections, respiratory infections, body pains and others and thus underlines the pharmacological usefulness of the plant.

Modern science is gradually providing evidence to support such statements by showing that extracts from various parts of the plant contain considerable antibacterial and antifungal activity. These results have generated interest on further research on the possibility of using Hedychium coronarium as an organic substitute to synthetic antimicrobials. One of the most important factors linking the Hedychium coronarium flower to the presence of antimicrobial action, the plant's essential oil. Plant based essential oils constitute a complex mixture of bioactive constituents including monoterpenes, sesquiterpenes and phenolic compounds having proven antimicrobial activity. Coupling with one another these compounds contribute to pathogenic microorganisms' growth inhibition and this is why essential oils can be considered as perspective source of new antimicrobial agents.

Notwithstanding the utilization of the plant as an antimicrobial specialist, further examination is being led on the cancer prevention agent, calming and potentially pain relieving jobs of Hedychium coronarium.These findings extend new directions in the synthesis of new and unique pharmaceuticals and nutraceuticals from this plant, which will be natural and renewable sources of contemporary medicines.

II. METHODOLOGY

Collection of Plant Material and Sample Preparation for Extraction

Inflorescent rhizomes of Hedychium coronarium were gathered from the nursery of Ramniranjan Jhunjhunwala School at Ghatkopar, Mumbai. The rhizomes were first washed under running water for onehour and afterward washed with Tween 20 and scour the rhizome with a delicate brush to remove the dirt particles. After de-cleaning the rhizomes were ground, gauged and put in a flack that was covered with aluminum foil. 50 ml of refined water was added to 6 grams of the ground rhizomes and left to go through hydro-refining in a water shower at 69 0C for 60 minutes. The distillate was moved to an isolating pipe, and hexane was included a 10:30 proportion (hexane: In one case, the watchword 'water' has supplanted the other key terms in a set containing multiple hundred passages in the source text.The hexane layers were then collected, left to dry for 24 hours and the weights of the hexane solution and the essential oils were used to determine the percentage yield. The dried residue was dissolved in an extraction solvent to prepare a stock solution of 100mg/mL for the subsequent tests.

Qualitative Test for Presence of Terpenoids

Extracts were analyzed for terpenoids using:

1. **Vanillin-Sulphuric Acid Reagent:** With the assistance of a pipette, 1 mL of the concentrate was added to 1 mL of vanillin-sulphuric corrosive reagent and the items warmed. A shade of purple-blue was for terpenoids.
2. **Anisaldehyde Reagent:**To the 1 mL of the concentrate, 1 mL of anisaldehyde reagent was added and the combination was warmed. A pink-purple tone was related with terpenoids.

Qualitative Thin-Layer Chromatography (TLC)

Attention was done on silica gel plates utilizing hexane, ethyl acetic acid derivation and frosty acidic corrosive in the proportion of 8:1. 5:0. 5 as the dissolvable framework. For terpenoids location tests were put on plates, treated with vanillin-sulphuric corrosive reagent, and warmed at 110°C for 5 minutes.

High-Resolution Gas Chromatography Mass Spectrophotometry (HR-GCMS)

The recognizable proof of the boundaries of the medicinal oil was finished utilizing AccuTOF GCV MS with combined silica slim HP5 segment. GC/MS settings were utilized in the accompanying way: electron ionization energy of 70 ev and the helium was utilized as the transporter gas at 1 ml/min stream rate. 00 mL/min. Injector and the MS move line temperatures were found at 4000C and 2800C correspondingly. The temperature program of the segment is introduced in the accompanying table: 1. Parts were perceived comparative with maintenance factors and spectra with the NIST08 LIB information base.

High-Resolution Liquid Chromatography Mass Spectrophotometry (HR-LCMS)

HR-LCMS was finished on the Q-Exactive In addition to Biopharma framework that had a Hypersil Gold 3 micron 100 x2 section. 1 mm segment. Dissolvable A was 0. Eluent A was 1% formic corrosive in water and dissolvable B was methanol. The investigation was finished north of 35 minutes at a stream pace of 0. 3 mL/min.

Studies on Pharmacological Properties

Antioxidant Study:

- **Total Phenols:** Not entirely settled by the Folin-Ciocalteu strategy at 720 and 745 frequencies and in type of gallic corrosive same.
- **All out Flavonoids:** Estimated utilizing Aluminum chloride colorimetric strategy with absorbance estimated at 400 nm in quercetin standard circumstances.
- **Cell reinforcement Action:** Determined from the rate consistent of Mo(VI) to Mo(V) and green phosphate/Mo(V) complex at 740 nm.

Synergistic Effects with Antibiotics:

- **Microorganisms:** Microorganisms employed here were Escherichia coli NCIM 2065, Pseudomonas aeruginosa NCIM 5210 and Staphylococcus aureus NCIM 2127.
- **Antibiotics:** Antibiotic discs used in this experiment were obtained in advance with their uses being amikacin, gentamicin, tetracycline and vancomycin all of which were acquired from Himedia Laboratories.
- **Antibacterial Activity:** Assessed by means of the agar plate method with the concentration of essential oil/10% DMSO=1/1.

Antihaemolytic Study:

Plated on blood agar, refined in 100 µl of the oils and brooded at 37 °C for 24 h to explore hemolysis.

Biofilm-Inhibiting Studies:

- **Microtitre Dish Biofilm Formation Assay:** Examined by crystal violet assay used to determine biofilm formation inhibition.

This procedure guarantees a broader analysis of the features and effectiveness of theE-Hedychium coronarium essential oils, their phytoconstituents together with the pharmacological effects..

III. RESULTS &DISCUSSION

With the data given in tables 1, 2 and 3 above show that H. coronarium aqueous extract of rhizome has higher antioxidant activity compared to that of the essential oils therefore the oils is highly active in microbial inhibition in specific gram positive bacterial strains. The combination of the essential oil with different antibiotics makes its potential of improving the efficiency of the antibiotics seen, and there are possibilities of using it for synergistic combination therapy for bacterial infection and improving the quality of the treatment.

Studies on Pharmacological Properties of Essential Oil

Antioxidant activity of aqueous extracts and essential oils of Hedychium coronarium is shown in Table 1. The total phenolic content was higher with aqueous extract 0. 83 µg/g and ever so slightly lower with essential oils 0. 81µg/g, but the difference was very small; almost negligible with a small standard deviation of ±0. 09 for aqueous and ±0. 02 for essential oils. Total flavonoids were higher in the essential oils (0. 09 µg/g ± 0. 032 and ±0. 003 respectively. While the essential oils had higher flavonoid content the antioxidant activity was significantly shifted more towards the aqueous extract (0. 44 µg/g) than the essential oils (0. 007 µg/g). The measurements for the antioxidant activity of the extract are quite stable with the standard deviation of the aqueous extract being ± 0. 01; however the essential oils are much less active and more stable with the standard deviation of ± 0. 001. This substantial difference in the antioxidant activity can be attributed to show that even though the flavonoid content which was determined and quantified using UV spectrophotometer on the essential oils is higher than that of the aqueous extract, the water extract contains a much higher radical scavenging effect implying that the process of extraction determines the effectiveness of antioxidants.

Table 1 Antioxidant Activities of Aqueous Extracts and Essential Oils

Extract Type	Total Phenols (µg/g)	Total Flavonoids (µg/g)	Antioxidant Activity (µg/g)
Aqueous	0.83 ± 0.09	0.06 ± 0.003	0.44 ± 0.01
Essential Oils	0.81 ± 0.02	0.09 ± 0.032	0.007 ± 0.001

The antimicrobial activity of the rejuvenating oil (EO) of Hedychium coronarium J. Koenig against various stock bacterial and contagious strains is given in Table 2. The outcomes got demonstrate that the EO has serious areas of strength for an activity on a portion of the bacterial example. Prominently, the medicinal balm gave zone of restraint of 15 mm against Staphylococcus aureus and 17 mm against Corynebacterium diphtheriae. It showed no inhibitory action against Escherichia coli, Salmonella typhi, and Candida albicans since the zone of hindrance was zero. An absence of zone of restraint has demonstrated that the microorganisms are non-defenseless to the particular rejuvenating oil tried at the given conditions. The qualitative difference in the bacterial strains' trend provides evidence that the strategy adopted by the essential oil is selective in its antimicrobial nature, and may be due to the specific reactions that the chemical components of the EO may have on the bacterial cell walls or on the membranes of the bacterial cells.

Table 2 Antimicrobial Effects of Essential Oil of Hedychium coronarium J. Koenig Against Laboratory Maintained Cultures

Bacterial Strain	Zone of Inhibition (mm)
	Undiluted EO
Escherichia coli	0
Staphylococcus aureus	15
Corynebacterium diphtheriae	17
Salmonella typhi	0
Candida albicans	0

Table 3 is on the interaction between hedychiumcoronarium j. koenig EO and different antibiotics on Escherichia Coli Ncim 2065. The table shows the zone of inhibition in millimeters for each antibiotic individual alone, EOs individual alone and the synergistic effects. The data reveal that the addition of the oil to antibiotics: Amikacin, Gentamicin, Vancomycin; shows a marked improvement in the anti microbial activity than the antibiotics alone. Actually, the synergy of treatment with Amikacin and EO reduced the entire zone of inhibition by maximal diameter of 26. 75 mm, higher than 23 mm obtained in the use of Amikacin alone, thereby suggesting a synergistic effect of the combination. In the same way, the use of EO along with Gentamicin caused the area of inhibition to rise to 28. 75 mm from 20. 5 mm and results of Gentamicin alone were also synergistic with the zones of inhibition. Vancomycin with EO resulted in a mean zone of inhibition of 11. to increase with the combination of both antibiotics , peaking at 75 mm, up from 0 mm with Vancomycin alone reinforcing the synergistic interaction.

Then again, when Antibiotic medication was utilized together with EO, the width of the zone of hindrance was 11 mm equivalent to that got by the utilization of Antibiotic medication alone consequently showing an added substance impact.The essential oil alone failed to have any inhibitory activity against E. coli; equal to a zone of inhibition of 0 mm in all experiments.

Table 3 Synergistic Effect of Essential Oil of Hedychium coronarium J. Koenig with Antibiotics Against Escherichia coli NCIM 2065

Antibiotics Used	Average Zone of Inhibition (mm)	Effect
Amikacin	23	-
Oil	0	-
Amikacin + Oil	26.75	Synergistic
Gentamicin	20.5	-
Oil	0	-
Gentamicin + Oil	28.75	Synergistic
Tetracycline	11	-
Oil	0	-
Tetracycline + Oil	11	Additive
Vancomycin	0	-
Oil	0	-
Vancomycin + Oil	11.75	Synergistic

IV. CONCLUSION

By the collection and preparation of plant material and the described massive amount of analytical methods, conclusions can be drawn concerning the Pharmacokinetics of Hedychium coronarium. The antioxidant test shows that the aqueous extract depicts quite a high antioxidant activity (0. 44µg/g) than the essential oils (0.

007µg/g) although the total phenolic content of both rhizomes are almost similar. This underscores the efficiency of the extraction method in the enhancement or the antioxidant qualities since aqueous extraction is more productive of better antioxidants as compared to the procedure used in the extraction of essential oil. Concerning the antimicrobial movement of the natural ointment, the outcomes show that the oil acts specifically. While it has adequate hindrance against Staphylococcus aureus and Corynebacterium diphtheriae with restraint zones estimating 15 mm and 17 mm separately other tried strains like E. coli and Salmonella typhi are not affected. This selectivity indicates that the antimicrobial action may be possible only against certain bacterial species and perhaps because of specific orientation against their cell structures.

In addition, the current research by the combined approach shows that the oil has a boost effect on inhibitory consecution of Amikacin, Gentamicin, and Vancomycin on E. coli as evidenced by the enlarged zone of inhibition. Particularly, the increase in activity through the use of essential oils was impressive, the inhibition zones expanding from 23 mm up to 26. 75mm with Amikacin, from 20. 5 mm to 28. Ave range of: Gentamicin: 75 mm; from 0 mm to 11 mm of Tetracycline. 75 mm with Vancomycin. On the other hand, no synergism was detected with Tetracycline, one may conclude that the effect of the essential oil is specific not for all antibiotics. These results support the future application of Hedychium coronarium essential oil in the improvement of antimicrobial therapies, especially connected with particular antibiotics.

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