REVIEW ARTICLE

PHARMACOLOGICAL AND ETHNOBOTANICAL PROFILE OF *CORALLOCARPUS EPIGAEUS*: A REVIEW OF ITS TRADITIONAL USES, PHYTOCHEMISTRY, AND THERAPEUTIC POTENTIAL

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DOI: https://doi.org/10.5281/zenodo.16690700

Abstract:
Corallocarpus epigaeus (Rottl.) Hook.f., a member of the Cucurbitaceae family, is a traditionally valued medicinal plant widely used in Ayurveda and folk medicine. Distributed across tropical regions of India and parts of Africa, its tuberous roots, stems, and leaves exhibit diverse therapeutic properties. This review comprehensively outlines the pharmacological profile of *C. epigaeus*, supported by experimental evidence. Phytochemical investigations reveal that various extracts—especially methanolic and ethanolic—possess significant biological activities, including analgesic, antipyretic, anti-inflammatory, anthelmintic, antidiabetic, antibacterial, antifungal, and hepatoprotective effects. These findings validate the ethno pharmacological uses of *C. epigaeus* and support its potential as a source for developing novel therapeutic agents. Future studies should focus on the isolation and characterization of its active constituents and their mechanisms of action.

Keywords: *Corallocarpus epigaeus*, Plant Profile, Pharmacological Activity.

1. Introduction:

Traditional medicine refers to a diverse collection of knowledge, techniques, and practices that originate from the cultural traditions and beliefs of different communities. These methods—regardless of their scientific validation—are employed to promote well-being and to aid in the prevention, diagnosis, and treatment of both physical and psychological conditions. Some traditional healing systems are well-documented in written literature, while others rely on oral transmission from generation to generation. In many parts of the world, especially where access to conventional healthcare is limited, traditional medicine serves as a cornerstone of primary health care. Recognizing its widespread use and potential, the World Health Organization (WHO) advocates for the safe and evidence-based incorporation of traditional medicine into national healthcare frameworks (World Health Organization, 2023). [1]

Corallocarpus epigaeus (Rottl.) Hook.f. is a species in the Cucurbitaceae family, characterized as a herbaceous plant with a trailing or climbing growth habit, commonly found in tropical and subtropical regions. It is widely distributed across India—including states like Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra, and West Bengal—as well as in tropical Africa and parts of the Persian Gulf. Traditionally used in Ayurvedic and folk medicine, its tuberous roots are known for their antimicrobial, anti-inflammatory, and hepatoprotective properties. The plant is referred to by various local names such as "Akasgaddah" in Hindi and "Akashagarudan" in Tamil. Due to its significant medicinal potential, *Corallocarpus epigaeus* continues to be a subject of pharmacological interest. [2]

2. Plant Profile:

2.1. Taxonomical Classification

Kingdom: Plantae- Plants
Phylum: Tracheophyta
Subkingdom: Tracheobionta- Vascular Plants
Superdivision: Spermatophyta- Seed Plants
Division: Magnoliophyta- Flowering Plants
Class: Magnoliopsida- Dicotyledons
Subclass: Dilleniidae
Order: Violales
Family: Cucurbitaceae- Cucumber Family
Genus: *Corallocarpus*
Species: *Corallocarpus epigaeus* (Rottl). [3]

2.2. Vernacular Names:

TAMIL **:** Karutan Kilanku.
TELUGU **:** Murudonda, Nagadonda
MALAYALAM : Kollam Kova Kizhang
KANNADA **:** Akasha Garudagadde
MARATHI **:** Karunai, Kadavinai, Akashagurudi
HINDI **:** Murchiakand, Kirakanda, Kadvi Naahi, Naahi Kand
SANSKRIT **:** Kadamba, Katunahi, Mahamula. [4]

2.3. Botanical Description:

Corallocarpus epigaeus, a member of the Cucurbitaceae family, is a long-living vine that grows along the ground or climbs, and is locally referred to in Tamil as Karutan Kilangu, Kollan Kovai, or Akasagarooda. It develops from a tuberous root and can extend up to around 4 m in length.

- **Stems and Tendrils:** The stems are angular or slightly ridged, typically smooth or with fine hairs, and bear simple, elongated tendrils.
- **Leaves:** The leaves are palmately divided into 3 to 5 lobes, ranging from 2.5 to 9 cm in length and 3.5 to 11.5 cm in width. Leaf surfaces are softly hairy, featuring pointed tips, heart-shaped bases, and serrated edges. The petioles range in length from 1 to 3.5 cm and can be lightly

covered with hairs. The petioles range in length from 1 to 3.5 cm and can be lightly covered with hairs.

- **Flowers:** The species is monoecious with small yellow male flowers clustered in racemes (5–40 flowers) on peduncles 1–15 cm long, each flower being around 1–2 mm across and containing three erect stamens. Female flowers are typically solitary or occasionally grouped, on shorter pedicels, featuring an oblong, beaked ovary measuring 5–6.5 mm in length.
- Fruit: The berry is ovoid to ellipsoid in shape, measuring approximately 10–21 mm in length and 4–8 mm in width, and features a distinct beak ranging from 2.5 to 7 mm. It is smooth and glabrous, turning bright red at maturity except for a green basal cup and beak; it dehisces circumscissile at the base.
- **Seeds:** Pear-shaped, around 4 × 2.5 mm, smooth, and yellowish.
- **Phenology:** Flowering and fruiting occur from roughly December to March in its native range. [5]

3.Pharmacological Activities:

3.1. Analgesic Activity:

Tail Immersion Method: The mice were divided into four groups, each consisting of six individuals. The treatment groups included:

- **Group I (Control):** Received 2 mL/kg of 1% Tween-80 suspension orally.
- **Group II (Standard):** Administered Pentazocine at a dose of 30 mg/kg orally.
- **Group III (Test 1):** Treated with MCET at 150 mg/kg orally.
- **Group IV (Test 2):** Treated with MCET at 300 mg/kg orally.

To assess analgesic activity, the distal portion of each mouse's tail was immersed in water maintained at 55°C, and the latency to tail withdrawal was recorded. A cut-off time of 10 seconds was imposed to prevent tissue injury. Reaction times were observed at 0, 15, 30, 45, and 60 minutes after administration of the respective treatments. The methanolic extract (MCET) exhibited significant analgesic activity in the tail immersion test. This suggests that the extract may possess both peripheral and central mechanisms of analgesic action. [6]

3.2. Antipyretic Activity:

Yeast-Induced Pyrexia Method: - The study involved dividing rats into four groups, with six animals in each group. The treatment protocol was as follows:

- **Group I (Control):** Received 2 mL/kg of 1% Tween-80 suspension orally.
- **Group II (Standard):** Administered Paracetamol at 20 mg/kg orally.
- **Group III (Test 1):** Treated with methanolic crude extract of the test substance (MCET) at 150 mg/kg orally.
- **Group IV (Test 2):** Treated with MCET at 300 mg/kg orally.

Fever was induced by a subcutaneous injection of a 10% aqueous suspension of brewer's yeast at a dose of 10 mL/kg. Rectal temperatures were measured using a digital clinical thermometer before yeast administration and again 24 hours' post-injection. Animals that did not exhibit a minimum temperature rise of 0.7°C were excluded from the study. Following treatment, rectal temperatures were

recorded at 0, 1, 2, 3, 4, and 5 hours. The methanolic extract exhibited significant antipyretic activity by effectively lowering the increased body temperature in rats. Yeast-induced fever is attributed to enhanced prostaglandin synthesis and is commonly employed to evaluate the antipyretic potential of pharmacological agents. [6]

3.3. Anti-Inflammatory Activity:

3.3.1. Carrageenan-Induced Paw Edema in Rats: The anti-inflammatory activity of MCET was evaluated through the carrageenan-induced paw edema model in rats. Male rats were randomly grouped into four sets, each consisting of six individuals. The treatment protocols were as follows:

- **Group I (Control)** received a vehicle solution (2 ml/kg, orally) consisting of 1% Tween-80.
- **Group II (Standard)** was treated with Indomethacin (20 mg/kg, orally).
- **Group III (Test 1)** received MCET at a dose of 150 mg/kg orally.
- **Group IV (Test 2)** received an oral dose of MCET at 300 mg/kg.

After one hour of administering the test compounds, inflammation was triggered in all groups by injecting 0.1 ml of a 1% carrageenan solution into the sub plantar area of the right hind paw. Paw volume was measured using a plethysmometer at 0-, 60-, 120-, and 180-minutes post-injection. This model is well-established for evaluating acute inflammation and is characterized by a biphasic response. The initial phase (0–2 hours) is associated with the release of inflammatory mediators such as histamine, serotonin, and bradykinin. The second phase, peaking around 3 hours, is largely due to the production of prostaglandins. The degree of paw edema in rats treated with the extract was evaluated in comparison to both the control group (which received the vehicle) and the standard group (treated with Indomethacin). The anti-inflammatory effect of MCET appeared dose-dependent, with the 300 mg/kg dose showing significant inhibition of paw edema comparable to the standard drug. These results suggest that MCET likely exerts its effects through inhibition of cyclooxygenase (COX) activity, thereby reducing prostaglandin synthesis involved in the later phase of inflammation. [6]

3.3.2. Carrageenan-Induced Paw Edema in Female Wistar Rats: The anti-inflammatory activity of *C. epigaeus* was evaluated using the carrageenan-induced paw edema model in female Wistar rats weighing 120–150 g. A total of five groups, each consisting of six animals (n = 6), were used for the study. All rats were fasted overnight prior to the experiment, with access to water provided freely.

- **Group I and II** received distilled water (10 mL/kg, orally).
- **Group III** was administered the standard anti-inflammatory drug, Indomethacin (10 mg/kg body weight).
- **Groups IV and V** received ethanolic extracts of *C. epigaeus* at dosages of 200 mg/kg and 400 mg/kg body weight, respectively.

To induce acute inflammation, 0.1 mL of 1% carrageenan solution (prepared in 1% CMC) was injected into the subplantar area of the right hind paw in Groups II to V. The treatments were given by mouth one hour before carrageenan was injected. Paw thickness was recorded immediately after injection and at intervals of 30, 60, 120, 180, and 240 minutes using a vernier caliper. The results indicated that the ethanol extract of *C. epigaeus* exhibited a significant anti-inflammatory effect. Four hours' post-treatment, the 200 mg/kg group showed an 11.39% reduction in paw edema, while the 400 mg/kg group

exhibited a 34.01% decrease. In comparison, the standard drug Indomethacin showed a paw edema inhibition of 79.90%. Carrageenan-induced inflammation is a widely accepted model for evaluating anti-inflammatory agents due to its reproducibility and lack of systemic toxicity. It triggers a biphasic inflammatory response: the early phase (within the first 2 hours) involves histamine, serotonin, and kinins, while the later phase (peaking around 3 hours) is associated with prostaglandins and other slow-reacting substances. In conclusion, the findings suggest that *C. epigaeus* rhizome extract possesses notable anti-inflammatory properties. This supports its potential therapeutic use, either alone or in combination with other treatments, for managing inflammatory conditions. [7]

3.4. Anthelmintic Activity:

3.4.1. The anthelmintic potential of *Corallocarpus epigaeus* bark extract was assessed using adult Indian earthworms—*Lampito marutii*, *Eudrillus eugine*, and *Eisenia foetida*—due to their structural and physiological similarities to human intestinal roundworms, making them a suitable model for such studies.

Various extract fractions were prepared in 1% Tween 80 to yield concentrations of 2.5%, 5%, and 7.5%. Similarly, solutions of the standard reference drug, piperazine citrate, were made in distilled water at the same concentrations. Two milliliters of each test solution and the standard were individually diluted to 10 mL with normal saline and transferred into separate Petri dishes. Each group of earthworms, consisting of six individuals of roughly equal size from each species, was introduced into a separate Petri dish. Paralysis was recorded when the worms failed to recover even after being placed in saline, while death was confirmed by complete loss of movement and a noticeable loss of body colour.

The study measured the time required for each concentration to induce paralysis and eventual death. Results indicated that the ethanolic extract of *C. epigaeus* bark exhibited stronger anthelmintic activity compared to the aqueous extract, with effectiveness comparable to that of piperazine citrate. The ethanolic extract induced paralysis at every concentration tested, eventually resulting in the death of the worms. Additionally, a higher concentration of extract corresponded to a shorter time required to induce these effects, indicating that the extract's efficacy increased with dosage. [8]

3.4.2. Helminthiasis, caused by parasitic worms, remains a major health concern, as the immature stages of these parasites can invade the human body through the skin or gastrointestinal tract and eventually develop into mature worms that localize in specific tissues. To explore potential treatments, the tuber of *C. epigaeus* was extracted sequentially using different solvents—methanol, chloroform, ethyl acetate, and hexane—and tested against *Pheretima posthuma* (earthworms), which serve as a suitable model due to their physiological similarities to intestinal roundworms.

Normal saline was used as a control and maintained worm motility for over 8 hours. The anthelmintic effects of the various extracts were evaluated at concentrations of 25, 50, 75, and 100 mg/ml. The standard drug albendazole (20 mg/ml) was used for comparison.

- The methanolic extract caused paralysis within 1–2 minutes and death within 3–4 minutes, depending on the concentration. A more precise evaluation reported paralysis within 1.27–2.06 minutes and death within 3.26–4.38 minutes.

- The chloroform extract showed delayed action, with paralysis occurring between 4.75–6.19 minutes and death within 10.06–13.7 minutes.
- Among all extracts, the ethyl acetate extract showed the highest efficacy, inducing paralysis in 1.27–2.06 minutes and causing death within 3.84–4.38 minutes.
- The hexane extract took the longest, inducing paralysis within 6.08–7.77 minutes and death between 10.28–12.94 minutes.

Conversely, the reference drug albendazole (20 mg/ml) caused paralysis at 15.30 minutes and resulted in death at 34.18 minutes. These findings suggest that all *C. epigaeus* extracts exhibit significant dose-dependent anthelmintic activity, with ethyl acetate extract showing the highest potency due to its rapid action even at lower doses.

The anthelmintic effect was clearly dose-dependent, with higher concentrations reducing the time to paralysis and death.

The ethyl acetate extract was particularly promising. Phytochemical analysis identified various bioactive constituents such as alkaloids, tannins, phenols, flavonoids, steroids, saponins, and glycosides. These constituents likely contribute to the potent anthelmintic effect.

In conclusion, the ethyl acetate extract of *C. epigaeus* tuber demonstrates significant in-vitro anthelmintic activity, justifying its potential application as a natural alternative to conventional treatments for parasitic infections. [9]

3.5. Antidiabetic Activity:

3.5.1. The α-amylase inhibitory potential of the methanolic extract of *C. epigaeus* tuber was assessed using the 3,5-dinitrosalicylic acid (DNSA) colorimetric method. This method quantifies the concentration required to inhibit 50% of porcine pancreatic α-amylase (PPA) activity, expressed as the IC_{50} value. The percent inhibition was determined using the following formula:

% Inhibition = 100 − [(mean maltose in sample / mean maltose in control) × 100]

During the assay, α-amylase was pre-incubated with varying concentrations of the methanolic extract (ranging from 62.5 to 200 µg/ml), which had shown the strongest inhibitory effects during initial screening. A 0.5% starch solution in phosphate buffer was added as the substrate to initiate the enzymatic reaction. The mixture was incubated for 20 minutes and then treated with 2 ml of DNS reagent (composed of 1% DNSA and 12% sodium potassium tartrate in 0.4 M NaOH) to stop the reaction. It was then heated at 100°C for 15 minutes. Absorbance was measured at 540 nm to determine the enzymatic activity.

The dose-response curves generated from different concentrations of the methanol and acetone extracts were used to determine IC_{50} values, which were then compared to those of the standard inhibitor, acarbose, tested under similar conditions.

The methanolic extract exhibited strong α-amylase inhibitory activity. At concentrations of 0.1, 0.5, and 1 mg/ml, the extract inhibited enzyme activity by 75.76%, 81.52%, and 98.55%, respectively. In contrast, acarbose—used as the reference—showed only 18.75%, 29.06%, and 58.45% inhibition at 10, 40, and 100 µg/ml, with an IC_{50} of 83.33 ± 0.34 at 0.312 µg/ml. The methanolic extract outperformed the standard drug in terms of efficacy.

Kinetic analysis suggested that the methanol extract did not alter the Km value but reduced the Vmax, indicating a competitive inhibition mechanism. This suggests that the extract interferes with the enzyme's active site, likely mimicking the substrate or interacting with its carbohydrate-binding domain. The World Health Organization (1999) has recognized numerous medicinal plants, including members of the Cucurbitaceae family, for their antidiabetic properties. The data presented in this study supports that *C. epigaeus* tuber has promising antidiabetic potential, particularly through inhibition of carbohydrate-digesting enzymes such as α-amylase and α-glucosidase, which are critical in managing postprandial blood glucose levels.

Furthermore, the presence of active phytochemicals in the methanolic extract may be responsible for this enzyme inhibition. These compounds may serve as potential lead molecules for the development of new therapeutic agents targeting diabetes, especially through modulation of starch metabolism. [10]

3.5.2. The ethanolic extract of *Corallocarpus epigaeus* (EECE) was tested for its antidiabetic effect in both normal (normoglycemic) rats and those with alloxan-induced diabetes.

Alloxan-Induced Diabetic Rat Model:

To induce diabetes, rats were fasted for 24 hours and then administered alloxan monohydrate intraperitoneally at a dose of 120 mg/kg body weight in normal saline. One hour post-administration, animals were allowed free access to food. Blood samples were obtained from the tail tip under light ether anesthesia, both prior to and 24 hours following alloxan administration. Blood glucose levels were measured using haemoglucostrips along with a Pulsatum® glucometer. Animals with glucose levels exceeding 200 mg/dL after 48 hours were confirmed diabetic.

The animals were then randomly assigned to four groups (n = 6 per group):

- **Group I**: Control group (received 2 ml/kg vehicle orally)
- **Group II**: Standard group (treated with Glibenclamide 2.5 mg/kg)
- **Group III**: EECE at 200 mg/kg
- **Group IV**: EECE at 400 mg/kg

Blood glucose was measured at 0, 1-, 2-, 4-, and 8-hours following administration of treatments. In the diabetic model, the control group showed increasing glucose levels over time: 232.06, 235.86, 248.48, 265.52, and 289.41 mg/dL. In contrast, the group treated with 200 mg/kg EECE showed a decrease in glucose to 150.8 mg/dL by 8 hours, and the 400 mg/kg group exhibited a more pronounced reduction to 104.1 mg/dL. The EECE began exerting noticeable glucose-lowering effects between 1–2 hours post-treatment, similar to the reference drug Glibenclamide, and the higher dose produced effects statistically comparable to the standard treatment.

Normoglycemic Rat Model:

In the normoglycemic model, the rats were deprived of food for 18 hours but allowed free access to water. Baseline blood glucose levels were recorded at 0 hours, and then animals were divided into four groups (n = 6):

- **Group I**: Control (2 ml/kg vehicle)
- **Group II**: Glibenclamide (2.5 mg/kg)
- **Group III**: EECE (200 mg/kg)
- **Group IV**: EECE (400 mg/kg)

Blood glucose was monitored at 0, 1, 2, 4, and 8 hours after administration.

In the control group, glucose levels remained relatively steady (92.6 to 98.34 mg/dL), while the group treated with 200 mg/kg EECE showed a gradual decline to 79.9 mg/dL by 8 hours. The higher dose (400 mg/kg) produced a more substantial drop to 63.8 mg/dL. This reduction in glucose levels, particularly between 2–4 hours, mirrored the response observed with Glibenclamide, confirming that EECE at 400 mg/kg has comparable antihyperglycemic efficacy.

This study validates the effectiveness of the ethanolic extract of *C. epigaeus* rhizomes exerts significant antidiabetic activity, with effects comparable to the standard drug Glibenclamide in both diabetic and normoglycemic models. The results support the traditional use of *C. epigaeus* in the treatment of diabetes and highlight its potential for development as a natural therapeutic agent. [11]

3.6. Antibacterial Activity:

3.6.1. The antibacterial potential of *Corallocarpus epigaeus* was assessed using a modified version of the disc diffusion method, a widely accepted technique for evaluating antibacterial susceptibility. Bacterial cultures were revived from stock using saline (0.1 mL), and the inoculum was spread evenly over Mueller-Hinton Agar (MHA) plates prepared with 10 mL of MHA medium. Sterile discs (6 mm diameter) were impregnated with 20 µL of different solvent-based crude plant extracts and placed onto the agar surface inoculated with Gram-positive and Gram-negative bacterial strains. Solvent-only discs served as negative controls. Following incubation, the diameter of the inhibition zones surrounding the discs was measured to determine antibacterial activity.

The petroleum ether and hexane extracts of *C. epigaeus* leaves had no inhibitory effect against the tested bacterial strains. However, chloroform and acetone extracts exhibited comparable inhibition against *Staphylococcus aureus* (zones of 9.33 mm and 9.67 mm, respectively, at full concentration). Similarly, *Pseudomonas aeruginosa* responded to both chloroform and methanol extracts (zones of 7.03 mm and 7.06 mm, respectively, at 100% concentration). Among all, the chloroform extract showed the strongest inhibition against *Serratia marcescens* (7.67 mm), while methanol extract demonstrated the highest activity against *Escherichia coli* (11.33 mm) at full strength. *Klebsiella pneumoniae* was resistant to all tested extracts.

The acetone extract from *C. epigaeus* stem exhibited a concentration-dependent increase in inhibition zone size against *P. aeruginosa* and *S. marcescens* from 25% to 75%, but the zone size decreased at 100%. In contrast, hexane extract showed improved inhibition against *S. marcescens* up to 50% concentration, after which a sharp decline was observed. Chloroform extract showed a maximum inhibitory effect on *S. aureus* (11.33 mm), and methanol extract was most effective against *P. aeruginosa* (9.00 mm), both at 100% concentration. The chloroform and acetone extracts produced similar effects on *P. aeruginosa* (5.90 mm and 5.68 mm, respectively), and methanol, chloroform, and acetone extracts showed relatively equal zones of inhibition against *E. coli* (6.00 mm, 6.73 mm, and 6.13 mm, respectively).

Only *S. marcescens* was susceptible to petroleum ether and hexane extracts. In the case of *C. epigaeus* tuber, antibacterial activity generally increased with higher extract concentrations, except for petroleum ether, which showed reduced inhibition at 100% against *S. marcescens*. The 100% methanol, chloroform, and acetone extracts exhibited the highest inhibition zones against *S. marcescens* (21.76 mm,

20.31 mm, and 18.46 mm, respectively). Moderate antibacterial activity was also observed against *S. aureus* (12.17 mm, 11.50 mm, and 11.50 mm), *P. aeruginosa* (10.07 mm, 8.00 mm, and 6.93 mm), and *E. coli* (7.67 mm, 7.33 mm, and 6.37 mm) for the same extracts. As with the leaf and stem extracts, *K. pneumoniae* showed strong resistance to all tested tuber extracts. [12]

3.6.2. The antibacterial efficacy of the extracts was assessed using the agar well diffusion method. Wells measuring 6 mm in diameter were created on Mueller Hinton Agar (MHA) plates that had been previously inoculated with standardized bacterial cultures. Various concentrations (2.5, 5, 7.5, and 10 mg/mL) of the test extracts were introduced into the wells. Plates were incubated at 37°C for 24 hours. Solvent-only controls were included for comparison. The diameter of the inhibition zones was measured in millimeters, and all tests were conducted in triplicates and repeated three times to ensure consistency.

The antibacterial investigation revealed that different tuber extracts of *Corallocarpus epigaeus* significantly inhibited bacterial growth, and this effect was dose-dependent. An increase in extract concentration corresponded to a larger zone of inhibition. Among the tested samples, the ethyl acetate extract at 10 mg/mL showed the highest inhibition zone (22.96 ± 0.1 mm) against *Staphylococcus aureus*. Similarly, petroleum ether extract exhibited a notable zone of 22 ± 0.1 mm against *Pseudomonas aeruginosa*, followed by the methanol extract, which showed an inhibition zone of 19.06 ± 0.0 mm at the same concentration.

Conversely, the lowest inhibition (12.08 ± 0.1 mm) was noted with methanol extract against *P. aeruginosa*, and the petroleum ether extract showed a slightly higher but still low activity (15.01 ± 0.1 mm) against *S. aureus*. Interestingly, the methanol and chloroform extracts showed minimal effectiveness against *S. aureus*, while chloroform, ethyl acetate, and aqueous extracts were relatively less active against *P. aeruginosa* when compared with the standard antibiotic, ampicillin.

The observed antibacterial properties of the tuber extracts may be attributed to their natural adaptation to soil environments, which expose them to various microbial threats. As a defense mechanism, these tubers might produce a range of antimicrobial compounds. The broad-spectrum antibacterial activity exhibited could be due to the presence of multiple phytochemicals within the tubers. The natural products derived from plants offer valuable frameworks for developing new antibacterial agents that are safe for human use and can serve as alternatives to costly synthetic drugs.

The findings from this study strongly indicate that *C. epigaeus* tuber extracts possess significant antibacterial potential, likely due to the presence of bioactive secondary metabolites. These results provide a foundation for the future development of new antibacterial drugs. Moreover, isolating and identifying these active compounds could contribute to combating current and emerging infectious diseases. [13]

3.7. Antifungal Activity:

The antifungal potential of *Corallocarpus epigaeus* extracts was evaluated using the disc diffusion method. Fungal spores were spread on Potato Dextrose Agar (PDA) plates, which were then incubated at 25°C for three days. Discs impregnated with different plant extracts were placed on the surface of the inoculated plates, with the corresponding solvents serving as negative controls. Following incubation, antifungal activity was determined by measuring the diameter of inhibition zones around the discs.

Among the tested extracts—petroleum ether, hexane, chloroform, acetone, and methanol—only the methanol extract demonstrated strong antifungal efficacy against all tested fungal strains. Chloroform extract showed moderate inhibition against *Aspergillus niger*, *A. flavus*, *A. versicolor*, *Candida albicans*, and *C. tropicalis*. In contrast, the acetone extract did not inhibit *C. albicans* or *C. tropicalis*.

The stem extracts of *C. epigaeus* displayed mild to moderate antifungal effects. Petroleum ether and hexane extracts were active only against *A. niger*, *A. flavus*, and *A. versicolor*, suggesting limited antifungal scope. Among all plant parts and solvent extracts, the methanolic extract stood out for its consistent and significant antifungal action.

The superior antifungal activity observed in the tuber extract compared to the leaf and stem may be attributed to the tuber's continuous interaction with soil, which potentially exposes it to various pathogenic fungi. This exposure likely induces the production of natural antifungal compounds. The broad-spectrum activity may be linked to the presence of specific phytochemicals within the tuber.

All crude extracts tested showed some level of inhibition against *A. niger* and *A. flavus*, though the methanol extract was the most effective overall. The current study highlights the promising antifungal potential of *C. epigaeus*, particularly from its tuber, and supports its possible application in the development of antifungal therapies. Future research should focus on isolating and characterizing the bioactive constituents, evaluating their individual antifungal strength, and conducting toxicity studies to facilitate the creation of new antifungal agents. [14]

3.8. Hepatoprotective Activity:

A study was conducted on Wistar albino rats to assess the liver-protective potential of *Corallocarpus epigaeus* leaf extracts. Thirty rats were divided into five groups, each comprising six animals. Except for Group I (control), all other groups were administered carbon tetrachloride (CCl_4) at a dose of 1 ml/kg subcutaneously to induce liver damage. Group I received only normal saline (10 ml/kg, i.p.). Group II served as the toxic control, receiving only CCl_4. Group III was treated with the standard hepatoprotective agent, silymarin (25 mg/kg, i.p.). Groups IV and V received aqueous and ethanolic extracts of *C. epigaeus* leaves respectively, at a dose of 200 mg/kg daily for 15 days following CCl_4 administration.

At the end of the treatment period, blood samples were collected from all animals via carotid bleeding. The samples were allowed to coagulate at 37°C for 30 minutes, followed by centrifugation at 3000 rpm for 10 minutes to separate serum. Various biochemical markers, including total and direct bilirubin, total protein, serum alanine transaminase (ALT), aspartate transaminase (AST), and alkaline phosphatase (ALP) were analyzed. Data were expressed as mean ± S.E. for six animals per group and subjected to one-way ANOVA followed by Dunnett's post-hoc test. A p-value of less than 0.05 was considered statistically significant.

CCl_4-induced hepatotoxicity is a widely used model for evaluating hepatoprotective agents due to its ability to generate trichloromethyl free radicals, which trigger lipid peroxidation and subsequent cellular membrane damage. As observed in Table 1, CCl_4 exposure led to a notable increase in serum levels of bilirubin, ALT, AST, and ALP, along with a decrease in total protein, indicating liver damage. However, rats treated with both aqueous and ethanolic extracts of *C. epigaeus* showed significant normalization of these biochemical markers. The extracts notably reduced elevated enzyme levels and

improved total protein levels, closely aligning with the silymarin-treated group, thereby indicating a protective effect on hepatic tissue.

Histopathological analysis supported the biochemical findings. CCl_4-exposed rats showed severe liver damage, including focal necrosis, fatty degeneration, portal inflammation, kupffer cell hyperplasia, and hydropic changes. In contrast, rats treated with plant extracts displayed reduced necrosis and milder pathological changes.

The hepatoprotective effects may be attributed to the presence of bioactive phytochemicals such as flavonoids, tannins, and triterpenoids—compounds known for their role in liver protection. Among the two extracts, the ethanolic extract exhibited a more pronounced effect ($p < 0.01$) compared to the aqueous extract ($p < 0.05$).

In conclusion, both aqueous and ethanolic leaf extracts of *Corallocarpus epigaeus* demonstrated significant hepatoprotective activity against CCl_4-induced liver injury in rats, with the ethanol extract being more effective. Ongoing phytochemical and pharmacological studies are aimed at identifying the active constituents and clarifying the underlying mechanisms responsible for the observed hepatoprotective effects. [15]

Conclusion:

The comprehensive investigation into *Corallocarpus epigaeus* (Rottl.) Hook.f. highlights its significant therapeutic potential across various pharmacological domains. Traditionally used in Ayurvedic and folk medicine, the plant has demonstrated promising analgesic, antipyretic, anti-inflammatory, anthelmintic, antidiabetic, antibacterial, antifungal, and hepatoprotective properties in preclinical studies. Among different plant parts, the tuber and leaf extracts, particularly those prepared with methanol and ethanol, consistently exhibited higher bioactivity, likely due to their rich phytochemical composition. However, further studies, including phytochemical isolation, mechanistic studies, toxicity profiling, and clinical evaluations, are essential to fully understand its pharmacological profile and ensure its safe application in modern medicine.

Funding:

Authors wish to state that no funding is involved.

Declaration of Competing Interest:

The authors declare that they have no competing interests.

Acknowledgement:

Authors express their deep sense of gratitude to Professor and faculty members of Department of Pharmaceutical Chemistry, College of Pharmacy, Madurai Medical College for providing the guidance to carry out the studies.

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