

# Antibacterial Activities of Different Solvent Extracts of *Centella asiatica* (L.) Urb. and its Endophytic Fungi

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**Abstract:** Evaluation of the antibacterial properties of fungal endophytes associated with *Centella asiatica* (L.) Urb., the ethnomedicinal plant widely used in traditional medicine practices, is part of the current study. Considering both molecular characterization and morphological characteristics, five endophytic fungi were isolated and identified namely *Cladosporium* sp. (F1), *Penicillium* sp. (F2), *Aspergillus* sp. (F3), *Colletotrichum* sp. (F4) and *Curvularia* sp. (F5). *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Bacillus cereus* are the four pathogenic bacterial strains that were examined for the antibacterial activity of plant extract and its endophytic fungus extract. The lowest concentration of the extract which inhibits any visual growth was considered to be Minimum Inhibitory Concentration (MIC). The zone of inhibition that different extracts produced against selected strains was measured. The results showed that among all endophytic fungal extracts studied F4, *Colletotrichum* sp. exhibited the highest zone of inhibition against *E. coli*, while the hydroalcoholic and aqueous extracts of the *Centella asiatica* leaf sample showed the maximum zone of inhibition against *E. coli* and *S. aureus*, respectively.

**Keywords:** Endophytic fungi, *Centella asiatica* (L.) Urb., Antibacterial activities, Apiaceae, ethnomedicinal, etc.

## 1. Introduction

*Centella asiatica* (L.) Urb. is an herbaceous, perennial plant commonly known as Indian pennywort and Asiatic pennywort belongs to the family Apiaceae [1]. It is locally known as Jal Brahmi, Beng Saag, and grows in many temperate and tropical marshy places. It is native to Southeast Asia, the Indian subcontinent, and the wetland areas of the southeastern US [2, 3]. Due to the generation of various bioactive secondary metabolites, *Centella asiatica* is one of the most significant therapeutic herbs used in Indian Ayurvedic traditions. It is also known for its antibacterial, antifungal, antidiabetic, antidiuretic, and antioxidant [4] properties. Its diverse bioactive ingredients, which possess cytotoxic and anticancer [5], cardioprotective [6], anti-inflammatory [7], neuroprotective [8], and wound healing [9] properties, are essential for improving medical problems. *C. asiatica* prevents the oxidative damage that takes place in neuropathological disorders, including stroke, Parkinson's disease, and Alzheimer's disease, by improving the antioxidant neurological state related to aging.

Endophytic microorganisms are recognized as one of the most chemically promising groups of microorganisms in terms of diversity and pharmaceutical potential. These are microorganisms, primarily fungi and bacteria, that proliferate in the intercellular spaces of higher plants without evidently harming their hosts. Endophytic fungi form enduring associations with their host plants because

endophytes have been shown to mediate the development of secondary metabolites in some plant species. A few endophytic fungi, such as *Colletotrichum gloeosporioides*, have been documented in various existing literature to produce asiaticoside and madecassoside as secondary metabolites [10]. Several bioactive secondary metabolites, such as steroids, alkaloids, peptides, terpenoids, tannins, quinone, flavonoids, and phenolics, are characteristic of endophytic microorganisms, particularly fungi [11]. It is now known that ethno-medicinal plants include a wealth of endophytes that may yield new metabolites with significant therapeutic value [12, 13, 14]. Certain natural compounds that are associated with endophytic fungi may have antibacterial, antioxidant, anti-tumour, and anti-inflammatory properties [15].

The exploration of plants for endophytic fungi can be of immense value in screening for potential metabolites. So, the present investigation has been designed to evaluate the antibacterial and antioxidant activities of endophytic fungi associated with *Centella asiatica* (L.) Urb.

## 2. Materials and Methods

### 2.1 Sampling

*Centella asiatica* plants with no visible symptoms of the disease were carefully selected and collected from the local area of Ranchi. The plant was identified and authenticated



# Estimation of total Phenolic, Flavonoid Content and Antioxidant Activity of Endophytic Fungi associated with *Centella asiatica* (L.) Urb.

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## ABSTRACT

The current investigation aimed to elucidate the free radical scavenging activity of *Centella asiatica* (L.) Urb. and its endophytic fungi. It is a perennial herb, widely used in ayurvedic practices, and has increased over the years basically due to its beneficial functional properties. Its potential antioxidant effect is due to its bioactive constituents. The present study deals with total phenolic content, total flavonoid content, and free radical scavenging activity. The free radical scavenging activity of the plant and its five isolated endophytic fungal extracts were estimated using DPPH and FRAP assays. The total phenolic and total flavonoid content was found to be higher in the hydroalcoholic extract than the aqueous extract of *Centella asiatica* (L.) Urb. while in endophytic fungal extract, *Penicillium sp.* (F2) and *Aspergillus sp.* (F3) showed the highest amount of total phenolic and total flavonoid content respectively. The results of the antioxidant assay indicated that the hydroalcoholic extract of *Centella asiatica* (L.) Urb. exhibited greater free radical scavenging activity than the aqueous extract, while *Aspergillus sp.* (F3) exhibited the highest scavenging activity among the ethyl acetate endophytic fungal extract. During the present work, the highest FRAP value of hydroalcoholic extract was observed while among endophytic fungal extracts, *Aspergillus sp.* (F3) has the highest FRAP value. Thus, in the present study, it can be concluded that the major contributor for antioxidant activity in each assay was the total flavonoid content present in extracts. So, the metabolites from fungi and their host plants are an excellent source of natural antioxidants and efficient against diseases that pose a threat to human health. Hence, these can be used for novel drug formulations.

**KEYWORDS-** Antioxidant activities, DPPH assay, FRAP assay, Phenolics, Flavonoids

## 1.INTRODUCTION-

*Centella asiatica* (L.) Urb. commonly known as Indian Pennywort, belongs to the family Apiaceae. It is a creeping perennial herb that frequently grows in Indian environments and has been traditionally used to treat a variety of ailments and has several distinct biochemical components that are crucial to its use in medicine and nutraceuticals. It has been used to treat skin conditions and has anti-inflammatory, antioxidant, wound-healing, and memory-boosting

properties [1]. Also, it has been shown to have a protective effect against oxidative damage caused by neurotoxicity induced by lead acetate [2].

Medicinal plants are a reservoir of endophytes with novel metabolites of therapeutic significance. Research on natural commodities can greatly benefit from the endophytes of medicinal plants [3]. Endophytes comprise a significant amount of the diversity of microorganisms [4]. It is more likely that