Phytochemical and antimicrobial screening of *Dracaena trifasciata* leaf extracts

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Abstract- *Dracaena trifasciata* (syn. *Sansevieria trifasciata*) species belongs to the genus *Dracaena*, commonly known as "snake plant". It is widely used as a common indoor plant, cultivated worldwide. The plant is recognized for pollutant-absorbing ability, it also produces large amount of oxygen at night and considered as air purifier plant for indoor environments. It can eliminate toxins, benzene, formaldehyde, trichoethylene and toluene from the surrounding. *Dracaena trifasciata* can reduce CO2 concentration by 10% to 20%. It's also been used as traditional remedies across Asia and Africa for cough, flu, respiratory tract inflammation, diarrhoea, wound healing, and snakebites etc. The plant contains bioactive compounds found in the roots and leaves include alkaloids, tannins, terpenoids, saponins, phenols, sterols- beta-sitosterol, stigmasterol, polyphenols, carbohydrates, and steroid-abamagenin (a glycoside that can break toxins), cardenolides (cardiac active steroids). It also possesses antibacterial, anti-fungal, antioxidant, anti-diabetic and anticancer activity.

The aim of this study to provide insights into the phytochemical constituents of methanol and hexane plant extracts prepared using solvent extraction method, along with the antimicrobial activity of *D. trifasciata* against *Staphylococcus aureus* (*ATCC 6538)* and *E.coli* (ATCC 8739) using agar well diffusion method. The study will also be helpful in exploring its use in traditional medicine and prospects for further advancement to promote the broader application.

Key words: Anti-toxic, antibacterial, anticancer, antioxidant, Sansevieria, snake plant

Introduction

Dracaena trifasciata, commonly known as the cylindrical snake plant or mother-in-law's tongue, (Said et al., 2015; Yumna et al., 2018) is categorized under the Genus *Dracaena*. *D.trifasciata* is a member of the family Asparagaceae, characterised by sword-shaped, dark green leaves with attractive patterns. It is a xerophytic perennial succulent plant, adapted to dry tropical and subtropical regions and high-salt soils and high-temperature climates (Takawira and Nordal, 2003; Lu and Morden, 2014; Gaylor, Juntunen et al., 2018). It is native to tropical West

Africa, specifically Nigeria, southern Asia, Madagascar and the Congo region. It is one of the poorly explored species, despite its relevance in folkloric medicine, very limited is known about its phytochemicals and biological activity. The *D.trifasciata* is recognized for its capability to absorb pollutants both indoors and outdoors, functioning as an air purifier, effectively absorbing harmful gases including formaldehyde, xylene, and total volatile organic compounds (Ullah et al. 2021; Guo et al. 2023; Sutrisno et al. 2023; Weerasinghe et al. 2023).

Dracaena trifasciata is valued for its leaf fibre's, ornamental value and ethnopharmacological background (Khalumba, Mbugua et al., 2005). The plant has high economic value, primarily due to the abundant fiber content, being used as a natural textile raw material (Adeniyi et al. 2020; Papaj 2022; Raj et al. 2023). The elastic, white, and strong fibers derived from D. trifasciata are used in the production of ropes, clothing, fishing lines, bowstrings, fine weaves, and binding cords due to their high strength (Sathishkumar 2016; Widyasanti et al. 2020). *D. trifasciata* has been used in traditional medicine in Asia and Africa in the form of juice or decoction from its leaves for the treatment of gonorrhea, earaches, toothaches, respiratory tract inflammation, flu, diarrhoea, coughs, haemorrhoids, influenza, inflammatory ailments and snakebites (Morton, 1981). The leaf latex of this plant is applied externally to treat bruises, sprains, wounds, abscesses, scabs, itchiness, and ear diseases, alongside being used as a natural antibiotic, hair tonic, and pain reliever (Sunilson et al. 2009; Andhare et al. 2012; Berame et al. 2017; Aseptianova 2019; Hijrah et al. 2019; Nahdi and Kurniawan 2019; Sun et al. 2019; Hartanti and Budipramana 2020; Thu et al. 2020; Pathy et al. 2021). In Africa, the latex from this plant can be used as a snake and insect repellent (Umoh et al. 2020; Sharma et al. 2023). Antibacterial agents are also derived from D. trifasciata. In tropical countries, D. trifasciata is used for treating inflammatory diseases and is sold in markets as a crude oil for treating snake bites, earaches, swelling, boils, and fever (Aliero et al. 2008; Anbu et al. 2009).

The plant has glycosides, phenolics, tannins, saponins, flavonoids and steroids, dicarboxylic acids, coumarins, and fatty acids (Yumna et al., 2018; Umoh et al., 2020). The abundance of such potent bioactive phytoconstituents makes it a biologically active plant species. *D.trifasciata* possess antibacterial activity, which has been ascribed to the presence of a number of bioactive compounds like quinolone, 3,4-dimethoxybenzoic acid, palmitaldehyde, 1,2-benzenedicarboxylic acid, and delta-undecalactone (Yumna et al., 2018). Fatty acids and their esters are the predominant phytochemicals in the leaves and rhizomes; there has been concrete evidence of their antimicrobial and anticancer potential (Jo´´zwiak et al., 2020).

Several fatty acids have shown anticancer activity by inducing apoptosis and autophagy and by inhibiting DNA topoisomerase (Jiang et al., 2017; Bharath et al., 2021).

Considering the apparent lack of available literature on the phytochemical constituents of different parts of S. cylindrica and their biological activity, the current study was intended to explore the phytochemicals in *D.trifasciata* and to evaluate its antimicrobial activity.

Material and Methods

Plant collection: Plant sample was collected from himalaya wellness company.

Part used: Leaves

Extract preparation: 50g of the ground powder was added into 250ml of solvent each solvent in wide mouth conical flask followed by 6-7 hours of shaking. Methanol and hexane extract was prepared, extracts were filtered using Whatman filter paper No 1. The filtrates were then concentrated by using water bath 60°-80°c and stored in screw-capped tubes in refrigerated prior to use.

Phytochemical analysis

Chemical tests for the screening and identification of bioactive chemical constituents in the medicinal plants under study were carried out for extracts using the standard procedures. For each procedure, details of these have been furnished below-

1. **Test for alkaloids-** The presence of alkaloids in the plant extract was tested 2 ml of the plant extract was treated with 1ml of each reagent separately.
   Mayer's reagent - Dull white precipitates indicated the presence of alkaloids.
   Dragendroff's reagent-Formation of orange or orange red precipitates indicated the presence of alkaloids.

2. **Test for flavonoids**
   Alkaline reagent test- to the test solution few drops of sodium hydroxide solution was added, Intense yellow colour was formed which turned to colourless on addition of few drops of dilute acid it indicated presence of flavonoids.

3. **Test for saponins-** This was carried out by taking 2ml solution of test sample in the test tube was then shaken vigorously. A persistent froth that lasted for at least 15mins indicated the presence of saponins.

4. **Test for tannins-** Ferric Chloride Test- The extracts were treated with 3 drops of 5% ferric chloride solution. A green-black or blue-black colour indicated the presence of tannins.

5. **Test for steroids-** Salkowski's tests- Treat the extract few drops of concentrated sulphuric acid poured by sides of the test tube red colour layer indicates presence of steroids and sterol compound in the extract.

6. **Test for triterpenoids-** Salkowski's tests -Extract was treated with few drops of concentrated sulphuric acid formation of yellow coloured lower

layer indicated presence of triterpenoids.

Determination of anti-microbial activity

Well-Diffusion method:

Pre-inoculated nutrient agar media was poured in Petri dishes, the plates were allowed to cooled and settled inside the laminar air flow. After the plates get solidified 8mm well was made using a well cutter. And 200µl sample was loaded in the well. The inoculated plates were incubated in incubator at 30-35°c for 12-24 hrs.

Strains used- *Staphylococcus aureus* (*ATCC 6538*), *E.coli* (ATCC 8739).

Results and Discussions

Phytochemicals like alkaloids, flavanoids, saponins, steroids, tanins were found present in the methanolic extract, whereas hexane have only triterpenoids present. But overall plant showed positive result for the above tests. From the **(Table-1)** results plant found rich in phytochemical content, which make the *D.trifasciata* anti-microbially active against microbes.

Table-01 Phytochemical analysis

Test	Methanol	Hexane
Alkaloids	+	-
Flavonoids	+	-
Saponins	+	-
tannins	+	-
Steroids	+	-
Triterpenoids	-	+

Table-02 Antimicrobial activity

SOLVENT	*S.aureus*	*E.coli*
Methanol	21	16
Hexane	11	NA
Positive control	32	29

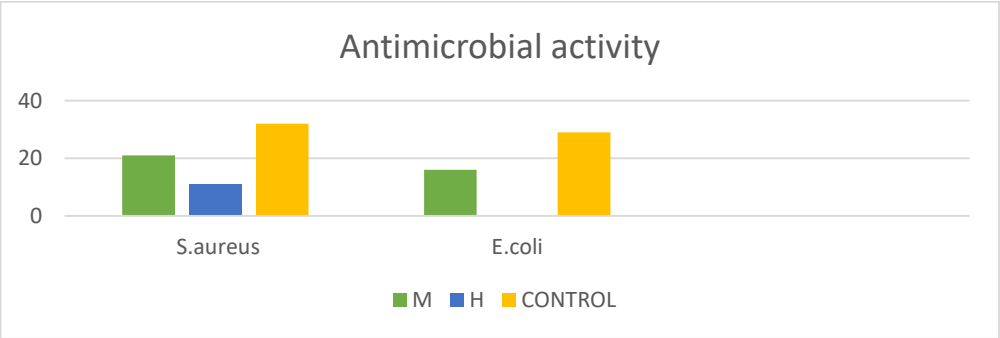

Figure-1

The assessment of the antibacterial activity of different extracts in this study was based on measurement of diameter of Zones of inhibition formed around the wells as depicted in **Tables-2** and **Figure-1**. Methanolic extract of *D.trifasciata* leaves was found more active with relatively larger zones of inhibition against tested pathogens. Hexane extract had smaller zones in comparison with methanol long with little activity against *Staphylococcus aureus* and no activity against *E.coli.*

But all extracts has shown a significant and modest antibacterial activity against *S.aureus*, *E.coli* except hexane extract against *E.coli* which exhibited no activity.

Conclusion

It can be concluded from our study and analysis results, that this plant is rich in phytochemicals like tannin, flavonoid, alkaloid, steroids, saponins etc, which makes the plant active against the microorganisms. Hence the plant was found active against *S.aureus* and *E.coli* .Comprehensive literature studies showed that the attributes of D. trifasciata can be applied as an, having a promising source of natural compounds for novel drug development. Further investigations are needed in this direction to assess the long-term and short-term toxicity associated with the use of this plant material, thereby making it a potential source for the development of modern drugs from natural sources.

Disclaimer Statement

Authors declare that no competing interest exists. The products used for this research are commonly used products in research. There is no conflict of interest between authors and producers of the product.

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