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EVALUATION OF PHYTOCHEMICALS AND ANTIMICROBIAL ACTIVITY OF *Hemidesmus indicus* roots EXTRACT

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ABSTRACT

In the present study was to investigate the phytochemical and antimicrobial activity of *Hemidesmus indicus* roots extract. *Hemidesmus indicus* roots showed that the presence of tannin, saponin, flavonoids, terpenoids, triterpeniods, antroquinone, steroids, polyphenol, glycosides and coumarins in in both extract. Alkaloids presence only methanol extract. Quantitative analysis showed that significant amount of phytochemicals such as flavonoids, phenol and terpenoids were present in *Hemidesmus indicus* roots. Histochemical studies further proved the presence of phytochemicals in *Hemidesmus indicus* roots. *Hemidesmus indicus* root was potential antibacterial activity confirmed against *Escherichia coli*, *Bacillus subtilis* and *Staphylococcus aureus* species of bacteria strains. Hemidesmus indicus roots was promising antifungal activity evidenced against *Candida albicans* and *Aspergillus niger* species of fungi strains.The Hemidesmus indicus roots has rich source of phytochemicals and possess potential antimicrobial activity. The results of the study concluded that Hemidesmus indicus roots may be used for the treatment of microbial infections.

Keywords: *Hemidesmus indicus* roots, Phytochemical, Antibacterial activity

INTRODUCTION

Use of plants for treating various ailments of both man and animal is as old practice as man himself. India is richly endowed with a wide variety of plants having medicinal value. These plants are widely used by all sections of the society whether directly as folk remedies or indirectly as pharmaceutical preparation of modern medicine (Bhagwati Uniyal, 2003). In recent times, focus on plant research has increased all over the world and a large body of evidence collected to show immense potential of medicinal plants used in various traditional systems (Ayurveda, Siddha and Unani) (Dahanukar *et al*., 2000). Medicinal plants are assuming greater importance in the primary health care of individuals and communities in many developing countries. There has been an increase of demand in international trade because of very effective, cheaply available, supposedly. Owing to the global trend towards improved quality of life there is considerable evidence of an increase in demand for medicinal plant.

Plant based drugs have been used worldwide in traditional medicines for treatment of various diseases. India is the largest producer of medicinal herbs and appropriately called the Botanical garden of the world. Plant produces these chemicals to protect itself but recent research demonstrates that many phytochemicals can protect humans against diseases. Keeping in view, the present study to investigate the phytochemical and antimicrobial activity of *Hemidesmus indicus* roots.

MATERIALS AND METHODS

Collection of plant materials

The roots powder of *Hemidesmus indicus* were purchased in January 2021 from siddha medicinal shop, Thanjavur, Thanjavur district, Tamil Nadu, India.

Preparation of plant extract

1 gram of the powder of *Hemidesmus indicus* roots were transferred in to different

conical flask (250ml). The conical flask containing 50ml of different solution (methanol and water). The conical flask containing *Hemidesmus indicus* roots were shaken well for 30 minutes by free hand. After 24 hrs, the extracts were filtered using Whatman filter paper No.1 and filtrate is used for further analysis.

Phytochemical screening

Chemical tests were carried out on the extract using standard procedures to identify the constituents as described by Sofowara (1993), Trease and Evans (1989) and Harborne (1973 and 1984). Total phenols estimated by the method of Edeoga *et al*., (2005). Flavonoid determine by the method of Bohm and Kocipai-Abyazan (1994). Total terpenoid content in the leaf extracts were assessed by standard method (Ferguson, 1956). Histochemical tests (John Peter Paul, 2014; Gersbach *et al*., 2001). The antibacterial activity was performed by disc diffusion method (NCCLS, 1993; Awoyinka *et al.*, 2007).

Qualitative and quantitative analysis

A number of phytochemicals isolated from plant material are used in the pharmaceutical drug industry today. The phytochemicals under investigation include secondary metabolites, many which are synthesized for plant defense and adaption to environmental stress. The phytochemicals can range from medicinally useful agents to treat varieties of diseases such as diabetes, malaria, anaemia (Fola., 1993).

In the present study was carried out on the *Hemidesmus indicus roots* revealed the presence of medicinally active constituents. The phytochemical characters of the *Hemidesmus indicus* roots investigated and summarized in Table-1 and figure 2 and 3. The phytochemical screening *Hemidesmus indicus* roots showed that the presence of tannin, saponin, flavonoids, terpenoids, triterpeniods, antroquinone, steroids, polyphenol, glycosides and coumarins in in both extract. Alkaloids presence only methanol extract.

RESULTS AND DISCUSSION

Table.1: Qualitative phytochemical analysis of *Hemidesmus indicus* roots extract

S. No	Phytochemicals	Methanol extract	Aqueous extract
1	Tannin	+	+
2	Saponin	++	++
3	Flavonoids	+	+
4	Steroids	+	+
5	Terpenoids	+	+
6	Triterpeniods	+	+
7	Alkaloids	+	-
8	Antroquinone	+	++
9	Polyphenol	++	++
10	Glycosides	++	+
11	Coumarins	+	++

(+) Presence, (++) High concentrations and (–) Absences

Quantitative analysis

Quantitative analysis revealed that the *Hemidesmus indicus* roots has flavonoids, terpenoids and phenol. Significant amount of flavonoids (50.00mg/gm), terpenoids (10.00mg/gm), and phenol (182.00mg/gm) were presented (Table 2). The above phytoconstituents were tested as per the standard methods.

Table.2: Quantitaive analysis of phytochemicals in *Hemidesmus indicus* roots powder

Phytochemicals	Result (mg/gm)
Phenol	182.00±12.74
Flavonoids	50.00±3.50
Terpenoid	10.00±0.70

Value were expressed as Mean ± SD for triplicate

Phenol and flavonoids have become an intense focus of research interest because of their perceived beneficial effects for health, including antidiabetic, anticarcinogenic, antiatherogenic, antiulcer, anti-thrombotic, anti-inflammatory, immunemodulating, antimicrobial, varodialatory, and analgesic effects (Dewick, 2001). In the present study, *Leucaena leucocphala* leaves contain phenol and flavonoids which may possess potential antidiabetic activity.

Similarly Kumar *et al.*, (2013) investigated the preliminary phytochemical screening of the leaves of the plant *Lasia spinosa* (Lour) Thwaites. The phytochemical screening showed that the methanol extract contained flavonoids, phenol, terpenoids, tannin, saponin, glycosides and alkaloid which are responsible for the biological activities.

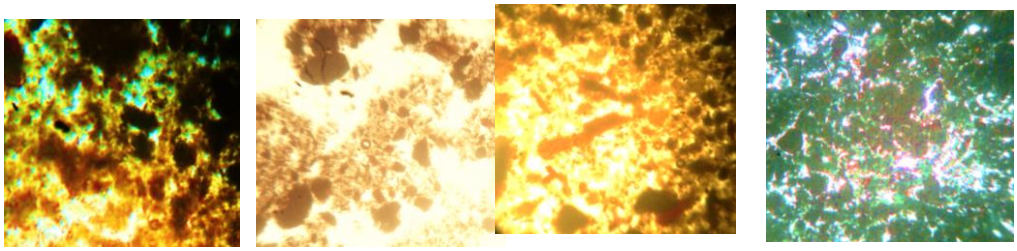
Histochemical analysis

Histochemistry is the branch of histology dealing with the identification of chemical components of cells and tissues; it is a powerful tool for localization of trace quantities of substances present in biological tissues. Histochemical techniques have been employed to characterize structure and development, and to study time course of deposition and distribution of major phytocompounds (Krishnan *et al.*, 2001). In the present study, *Hemidesmus indicus* roots were treated with specific chemicals and reagents. The *Hemidesmus indicus* roots powder treated with diluted ammonia and H_2SO_4 gave yellow colour indicates flavonoids. The *Hemidesmus indicus* roots powder treated with few drops of H_2SO_4 gave yellow color indicates the presence of tannin. Plant powder treated with Toludine blue gave Blue green/Red colour indicates the presence of polyphenol. Plant powder treated with Dinitrophenol hydrazine (few drops) gave Orange colour indicates the presence of terpenoids. (Table 3 and Figure 5**)**. These results further confirmed the presence of phytochemicals.

Table 3: Histochemical analysis of *Hemidesmus indicus* roots powder

Phytochemical	Result
Saponins	+
Flavonoids	++
Terpenoids	+
Polyphenol	++

Single plus (+) represents presence and double plus (++) represents high concentrations



Saponins Flavonoids Terpenoids Polyphenol

Figure 5: Histochemical analysis of *Hemidesmus indicus* roots powder

Antimicrobial activity of *Hemidesmus indicus* roots

Emergence of pathogenic microorganisms that are resistant/multi-resistant to major class of antibiotics has increased in recent years due to indiscriminate use of synthetic antimicrobial drugs. Nature has bestowed on us a very rich botanical wealth and a large number of diverse types of plants grow in different parts of the country. In addition, high cost and adverse side effects are commonly associated with popular synthetic antibiotics, such as hypersensitivity, allergic reactions, and immunosuppressant and are major burning global issues in treating infectious diseases (Karaman *et al.*, 2003). This situation forced scientists to search for new antimicrobial substances with plant origin.

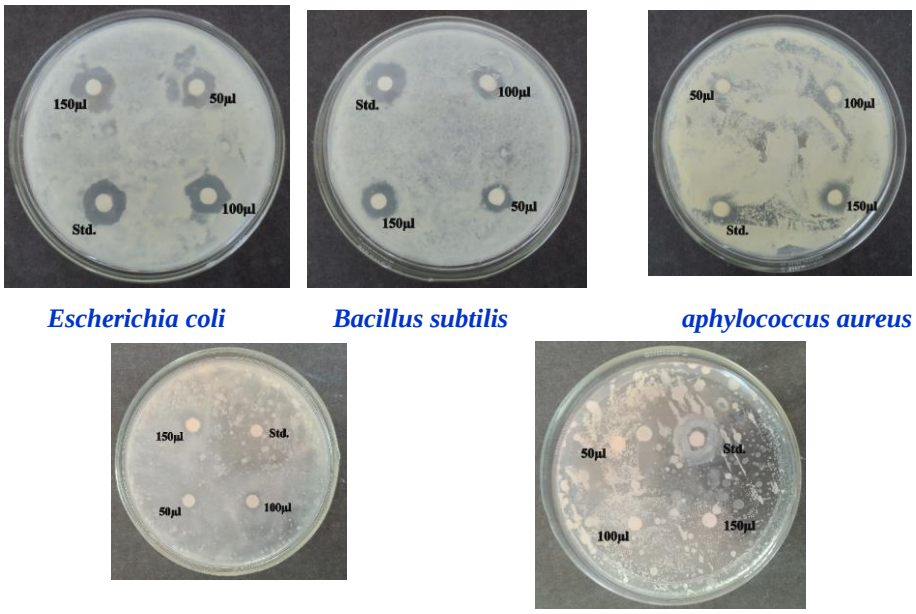
Plants produce a diverse array of secondary metabolites. Some of these metabolites have antifungal activity and are considered as a potential source of active principles in the formulation of new pesticides (Vyvyan 2002). Plant extracts with antifungal properties were used for controlling phytopathogens at laboratory, greenhouse and field level (Bergeron et al. 1995). More than 2000 plant species have been reported to have

antimicrobial and antifungal properties (Grainge and Ahmed 1988). Among 29 plant species, 15 plant extracts showed antifungal activity, with Acer nikoense (Nikko maple), *Glycyrrhiza glabra* and Thea sinensis being the most effective plants (Sato *et al*. 2000). There are 4 major types of Microbes: bacteria, fungi, protists and viruses. Recently, many investigators (Punnagai *et al*. 2016) have identified the antifungal properties of plant extracts.

Table. 4: Antimicrobial activity of *Hemidesmus indicus* roots

Microbial Strains	Concentration (µl)			Std. (30µl)
	50µl	100µl	150µl	
Bacteria				
***Escherichia coli* (mm)**	2.25±1.15	4.00±0.28	6.75±0.47	10.25±0.71
***Bacillus subtilis* (mm)**	2.00±0.14	3.25±0.22	5.50±0.38	10.00±0.70
***Staphylococcus aureus* (mm)**	1.25±0.80	3.00±0.21	4.50±0.31	9.50±0.66
Fungal				
***Candida albicans* (mm)**	1.00±0.07	2.50±0.01	4.25±0.29	7.50±0.52
***Aspergillus niger* (mm)**	0.50±0.03	2.00±0.01	3.75±0.26	7.25±0.50

Values expressed as Mean ± SD for triplicates
Bacterial standard: Chloramphenicol ; Fungal standard: Fluconazole



Escherichia coli *Bacillus subtilis* *aphylococcus aureus*

Candida albicans *Aspergillus niger*

Fig. 6: Antimicrobial activity of *Hemidesmus indicus* roots

Conclusion

The *Hemidesmus indicus* roots has rich source of phytochemicals and possess potential antimicrobial activity. The results of the study concluded that *Hemidesmus indicus* roots may be used for the treatment of microbial infections.

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