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## PHYTOCHEMICAL EVALUATION AND ANTIMICROBIAL STUDIES ON *TERMINALIA PALLIDA* BRANDIS (COMBRETACEAE) – A RARE AND ENDEMIC MEDICINAL PLANT

Kummari Rajasekhar\*<sup>1</sup>,  
Rudraraju Reddy<sup>1</sup>, Venkata Raju<sup>1</sup>

<sup>1</sup> Phytomedicine Division, Department of Botany, Sri Krishnadevaraya University, Anantapur-515 003, Andhra Pradesh, INDIA.

### ABSTRACT

The present paper deals with phytochemical screening and antimicrobial studies on *Terminalia pallida*, a rare and endemic species to Sheshachalam hills (Chittoor), Andhra Pradesh, India. The stem bark, leaves and fruits were screened for phytochemical composition and antimicrobial activities, which revealed that the phenolic compounds especially alkaloids and coumarins may be responsible for antimicrobial activities. The most susceptible microorganisms were found to be *Bacillus cereus*, *Candida albicans*, *Escherichia coli*, *Klebsiella pneumoniae*, *Micrococcus luteus*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, and *Staphylococcus aureus*. *Terminalia pallida* could be exploited for better infection management of various diseases.

**Keywords:-** *Terminalia pallida*, *Combretaceae*, *Endemic*, *Phytochemical evaluation*, *Antimicrobial studies*.

### INTRODUCTION

The medicinal value of plants lies in some chemical substrates that produce a definite physiological action on human body. According to WHO report about 80% of the world populations are taking interest in indigenous medicinal plant remedies<sup>[1]</sup>. The use of plant extract and phytochemicals, with established antimicrobial properties, could be of great significance in therapeutic approaches. Therefore it is need to investigate traditional medicine with a view to

identify and exploit safe and effective remedies for ailments of both microbial and microbial origin. It is estimated that about 75% of the biologically active plant derived compounds, presently in use worldwide, have been derived through follow up researchers to verify the authenticity of data from folk and ethnomedicinal uses. So there is a great scope for new drug discoveries based on traditional plant uses<sup>[2]</sup>. Phytoconstituents are the natural bioactive compounds, exhibit potential therapeutic properties, work with nutrients and fibers to form

### Correspondence Author



**K. Rajasekhar**

Sri Krishnadevaraya University,  
Anantapur-515 003, Andhra  
Pradesh, INDIA.

**Email:** rrvnkataraaju@yahoo.com

an integrated part of defensive system in which alkaloids, flavonoids, saponins, terpenoids, phenolics, tannins, etc considered as major constituents in crude drugs. These plant derived compounds are considered to be active against human pathogenic microorganisms. In the present study *Terminalia pallida*, a rare and endemic species to Sheshachalam hills of Chittoor district<sup>[3,4,5 and 6]</sup>, Andhra Pradesh, was selected and screened against multidrug resistant bacteria including *Bacillus cereus*, *B. subtilis*, *Candida albicans*, *Escherichia coli*, *Klebsiella pneumoniae*, *Micrococcus luteus*, *Pseudomonas aeruginosa*, *Salmonella typhimurium* and *Staphylococcus aureus*. The ethnobotanical information obtained from the traditional herbal practitioners may serve as an initial lead for isolation and characterization of bioactive compounds (Cox & Balick, 1994).

## MATERIAL & METHODS

The different parts of plant material was collected from Tirumala hills of Chittoor district and identified with the help of regional floras<sup>[3,4,5 and 6]</sup>. The ethnomedicinal property of the species was recorded based on interviews conducted with adivasi communities, inhabited in and around the forests. The identification of the voucher specimens was confirmed by comparing with authentic specimens in Sri Krishnadevaraya University Herbarium (SKU), Anantapur, Madras Herbarium (MH), Coimbatore and Central National Herbarium (CAL), Kolkata, and the same was deposited in Sri Krishnadevaraya University Herbarium (SKU), Anantapur.

The plant material (Stem bark, Leaf and Fruit) was shade dried, powdered (100 g) and successively extracted with ethyl acetate, methanol and water using Soxhlet apparatus for 6 hours<sup>[7]</sup>. The extracts were filtered, concentrated under reduced pressure to dryness and subjected for phytochemical screening using standard procedures<sup>[8, 9 and 10]</sup>. The positive reaction was observed for 30 different groups of phytochemical compounds. Alkaloids, phenols, anthocyanins, anthracene glycosides, saponins and steroids were recorded as most predominant chemical

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derivatives followed by flavones, catecholic compounds, proteins, gallic tannins, etc (Table-1).

The microbial strains such as *Bacillus cereus*, *B. subtilis*, *Candida albicans*, *Escherichia coli*, *Klebsiella pneumoniae*, *Micrococcus luteus*, *Pseudomonas aeruginosa*, *Salmonella typhimurium* and *Staphylococcus aureus* were used to test the inhibition activity of the extracts. The organisms were obtained from the microbial Type Culture Collection Centre, Institute of Microbial Technology (IMTECH) Chandigarh, India. The antimicrobial activity was performed by employing the disc diffusion method adopted by Bauer et al., (1966) and Cruickshank (1968)<sup>[11 and 12]</sup>. The semisolid crude extracts of each sample dissolved in the suspensive solvent and concentrations of 25, 50 and 75 mg/ml were prepared. Sterilized paper discs containing different concentrations of the extracts were placed on the surface of petriplates, containing 20 ml of respective media seeded with 0.1 ml of previously prepared microbial suspensions. The assessment of antimicrobial activity was based on measurement of inhibition zones formed around discs. The plates were incubated for 24 h at 37<sup>o</sup>C and the diameter of the inhibition zones was recorded<sup>[13]</sup>. Three independent trials were conducted for each concentration to confirm the activity.

## RESULT & DISCUSSION

Phytochemical analysis of ethyl acetate, methanol and water extracts of stem bark, leaves, fruits revealed that alkaloids, anthocyanins, Anthracene glycosides, coumarins, phenols and saponins were present in all polar solvents, while dihydrochalcones and steroids found in stem bark and leaf samples while catecholic compounds in methanol extracts of fruit samples.

Invitro antimicrobial properties of *Terminalia pallida* (table-2) revealed that all crude extracts had significant antimicrobial activity against the test pathogens. Fruit extracts of ethyl acetate and methanol shows maximum inhibition activity than the stem bark and leaf. The fruit extract of methanol exhibited maximum inhibition zones (22 mm) against *Klebsiella pneumoniae* (MTCC-7028), a

Gram negative bacterium when compared that of ethyl acetate. The leaf extracts of methanol shows minimum inhibition activity (10 mm) against

*Bacillus cereus* (MTCC-4079), a Gram positive bacterium.

**Table-1 Distribution of phytochemical constituents in *Terminalia pallid***

S. NO	Compound	Stem Bark			Leaf			Fruit		
		EA	M	W	EA	M	W	EA	M	W
1	Alkaloids	+	+	+	+	+	-	+	+	+
2	Anthocyanins	-	+	+	-	+	+	-	+	-
3	Anthocyanidins	-	-	-	-	-	-	-	-	-
4	Anthracene glycosides	-	+	-	-	+	+	-	-	+
5	Antraquinones	-	-	-	-	-	-	-	+	-
6	Aucubins	-	-	-	-	+	-	-	-	-
7	Carbohydrates	-	-	-	-	-	-	-	+	-
8	Carotenoids	-	-	-	-	-	-	+	-	+
9	Catecholic compounds	-	-	-	-	-	+	-	+	-
10	Coumarins	-	+	+	-	+	-	-	+	-
11	Emodins	-	-	-	-	-	-	+	-	-
12	Fatty acids	-	-	-	-	-	-	-	-	-
13	Flavonoids	-	-	-	-	+	-	-	-	-
14	Flavones	+	-	-	-	-	+	-	+	-
15	Flavonols	-	+	-	-	-	-	-	-	-
16	Flavonones	-	-	-	-	+	-	-	+	-
17	Dihydrochalcones	-	+	+	+	-	+	-	-	-
18	Gallic tannins	-	+	+	-	-	-	-	+	-
19	Glycosides	-	+	+	-	+	+	-	+	-
20	Iridoids	-	-	-	-	-	-	+	-	-
21	Lignans	-	+	-	-	-	-	-	+	-
22	Phenols	-	+	-	-	+	+	-	+	+
23	Polyoses	-	-	-	-	+	+	-	+	-
24	Poly urinoidis	-	-	-	-	-	-	-	-	-
25	Proteins	-	-	-	-	-	-	-	-	+
26	Reducing compounds	-	-	+	-	-	+	-	-	-
27	Saponins	-	+	+	-	-	+	-	+	+
28	Steroids	-	+	-	-	-	+	-	+	-
29	Triterpenoids	-	+	-	-	-	+	-	-	-
30	Volatile oils	-	+	-	-	-	-	-	+	-

**Table 10: Antimicrobial activity of Ethyl acetate and Methanol extracts of *Terminalia pallida*.**

Organism											
	Part	mg/ml	Bc (MTCC - 4079)	Bs (MTCC- 1133)	Ca (MTCC – 7315)	E. coli (MTCC – 1668)	Kb (MTCC – 7028)	MI (MTCC – 7256)	Pa (MTCC – 7296)	Sa (MTCC - 98)	St (MTCC – 7443)
Ethyl acetate: Inhibition Zone (mm <sup>-1</sup> )	Leaf	25	6	-	-	-	10	-	6	10	-
		50	8	-	-	-	14	-	9	12	-
		75	12	-	-	12	-	-	14	15	-
	Stem bark	25	7	-	10	-	10	-	-	-	6
		50	9	-	12	-	11	-	-	-	8
		75	14	-	15	-	11	10	-	12	14
	Fruit	25	-	6	-	10	-	10	-	-	7
		50	-	10	-	12	-	12	-	-	9
		75	-	15	-	10	-	16	-	-	14
Methanol: Inhibition Zone (mm <sup>-1</sup> )	Leaf	25	6	-	12	-	-	10	-	6	-
		50	8	-	12	-	-	15	-	10	-
		75	10	-	-	-	-	12	-	15	-
	Stem bark	25	-	10	-	-	6	10	-	-	-
		50	-	12	-	-	9	12	-	-	-
		75	-	15	-	-	10	14	-	-	-
	Fruit	25	8	-	8	10	14	-	10	-	-
		50	12	-	12	14	18	-	15	-	-
		75	16	-	16	18	22	-	-	-	-

Bc-*Bacillus cereus*; Bs-*B. subtilis*; Ca-*Candida albicans*; E. coli-*Escherichia coli*; Kb-*Klebsiella pneumoniae*; MI-*Micrococcus luteus*; Pa-*Pseudomonas aeruginosa*; Sa-*Salmonella typhimurium*; St-*Staphylococcus aureus*.

## CONCLUSION

The present work revealed that *Terminalia pallida* provides as a potential source of antimicrobial agents with its significant inhibition activity against various clinical isolates and suggest to perform further studies for isolation and identification of active principles. As the test species is endemic to the Sheshachalam hills in Chittoor district and the local adivasis possess abundant knowledge on

therapeutic properties, the molecular studies have been conducted in laboratory for elucidation of bioactive compounds.

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