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Preliminary Phytochemical Screening and Antimicrobial Studies on Vitex Quinata (Lour) F.n. Williams (Verbenaceae) From Andhra Pradesh

KEYWORDS: Vitex quinata, Verbenaceae, Phytochemical screening, Antimicrobial studies

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ABSTRACT *The present paper deals with phytochemical screening and antimicrobial studies on Vitex quinata, one of the potential medicinal plants endemic to Visakhapatnam district in Andhra Pradesh, India. The leaves, stem bark 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. Vitex quinata could be exploited for better infection management of various diseases.*

Intoduction

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 population showing interest in indigenous medicinal plant remedies [1]. The use of plant extract and phytochemicals, with established antimicrobial properties, could be of great significance in therapeutic approaches. Therefore intensive investigation on traditional medicine with a view to identify and exploit safe and effective remedies for ailments of both microbial activity and microbial origin is essential. 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[2]. Phytoconstituents are the natural bioactive compounds, exhibit potential therapeutic properties, work with nutrients and fibers to form an integrated part of defensive system in which alkaloids, flavonoids, glycosides, triterpenoids, phenolics, steroids, 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 *Vitex quinata*, most potential medicinal plant, used to cure different aliments like cold and cough, headache, fever and weakness of nerves, etc by local tribal people in the region. The plant sample were collected from Minumuluru forest in Visakhapatnam district, Andhra Pradesh, 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.

Material & methods

The different parts of plant material was collected from Minumuluru reserve forest, Visakhapatnam district and identified with the help of regional floras [3, 4, 5]. The ethnomedicinal property of the species [6] was recorded based on interviews conducted with adivasi communities, inhabited in and around the forests. The identification of the voucher specimen 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 (leaf, stem bark) was shade dried, powdered (100 g) and successively extracted with petroleum either, ethyl acetate, methanol and water using Soxhlet apparatus for 6 hours [7]. The extracts were filtered, concentrated under reduced pressure to dryness and subjected for phytochemical screening using standard procedures [8, 9 and 10]. The positive reaction was observed for 30 different groups of phytochemical compounds. Alkaloids, anthracene glycosides, flavonoids, glycosides, phenols, triterpenoids, saponins and steroids were recorded as most predominant chemical derivatives followed by anthocyanins, flavonones, catecholic compounds, volatile oils, saponins, 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) [11, 12]. The semisolid crude extracts of each sample dissolved in the suspective 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^{0}C and the diameter of the inhibition zones were recorded [13]. Three independent trials were conducted for each concentration to confirm the activity.

Result & Discussion

Phytochemical analysis of petroleum ether, ethyl acetate, methanol and water extracts of leaves and stem bark revealed that alkaloids, coumarins, flavonoids, glycosides, phenols and steroids were present in all polar solvents, while Carotenoids, emodins, iridoids polyoses recorded in methanol extract, while anthroquinones, carbohydrates, gallic tannins recorded aqueous extracts of stem bark samples only.

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Table-1 Distribution of phytochemical constituents in *Vitex quinata*

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

Table 10: Antimicrobial activity of Ethyl acetate and Methanol extracts of *Vitex quinata*.

Organism (Zone of Inhibition mm^{-1})											
Sol	Part	mg/ml	Bc (MTCC - 4079)	Bs (MTCC-1133)	Ca (MTCC – 7315)	E. coli (MTCC – 1668)	Kb (MTCC – 7028)	Ml (MTCC – 7256)	Pa (MTCC – 7296)	Sa (MTCC - 98)	St (MTCC – 7443)
Ethyl acetate	Leaf	25	8	-	-	-	8	6	6	-	7
		50	10	8	-	8	11	9	9	9	8
		75	12	10	11	10	12	11	10	12	9
	Stem bark	25	7	-	6	-	9	-	-	-	6
		50	9	6	8	7	10	6	-	8	8
		75	11	8	10	9	11	7	-	10	9
Methanol	Leaf	25	6	-	6	8	8	10	8	6	
		50	8	-	8	10	11	11	10	10	7
		75	10	-	10	12	14	12	11	13	9
	Stem bark	25	-	6	-	-	6	8	-	6	-
		50	-	7	7	-	9	10	-	7	-
		75	-	9	9	-	10	11	8	9	-

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

In-vitro antimicrobial properties of *Vitex quinata* (table-2) revealed that all crude extracts had significant antimicrobial activity against the test pathogens. Leaf extracts of ethyl acetate and methanol shows maximum inhibition activity than the stem bark. The leaf extract of methanol exhibited maximum inhibition zones (14 mm) against *Klebsiella pneumoniae* (MTCC-7028), a Gram negative bacterium when compared that of ethyl acetate. The stem bark extracts of methanol shows minimum inhibition activity (7 mm) against *Bacillus cereus* (MTCC-4079), a Gram positive bacterium.

Conclusion

The present work revealed that *Vitex quinata* 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 the local adivasis possess abundant knowledge on therapeutic properties of the test specie the molecular studies have been conducted in laboratory for elucidation of biosactive compounds.

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