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Review on documentation of some ethnomedicinal plants with antimicrobial properties in Yavatmal district of Maharashtra, India

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Abstract

Yavatmal district, situated in the Vidarbha region of Maharashtra, India, possesses a rich tapestry of biodiversity and a deeply embedded tradition of indigenous healthcare systems. Inhabited by diverse tribal communities such as the *Gond, Kolam, Andh, Korku*, and *Banjara,* the region relies heavily on forest flora for primary health management. With the escalating global concern over microbial resistance to conventional antibiotics, ethnomedicinal plants serve as a vital reservoir for novel, broad-spectrum antimicrobial agents. This review documents select ethnomedicinal plants native to Yavatmal district that exhibit verified or traditional antimicrobial properties, summarizing their botanical profiles, parts used, traditional applications, and underlying phytochemical bases.

Keywords: Ethnomedicine, Antimicrobial Properties, Yavatmal District, Vidarbha, Indigenous Knowledge, Phytochemistry.

1. Introduction

The utilization of plants for healing ailments is as old as human civilization. In developing nations, particularly in rural and tribal belts, traditional medicine remains the primary line of defence against numerous illnesses due to cultural familiarity and limited access to modern health infrastructure. Ethnomedicine represents an invaluable repository of traditional healthcare knowledge accumulated over millennia through empirical observations and cultural transmission between indigenous communities and their surrounding local flora. India, recognized as one of the world's mega-biodiverse nations, harbors diverse biogeographic zones and rich ethnobotanical traditions, with indigenous populations relying

extensively on native medicinal plants for primary healthcare needs [1]. In the state of Maharashtra, particularly across the Vidarbha region, remote rural and tribal enclaves maintain deep-rooted botanical traditions, utilizing crude extracts, pastes, and decoctions derived from local flora to manage various infectious and systemic ailments [2-3].

Despite the widespread availability and historical success of modern allopathic antimicrobials, the emergence of multi-drug resistant pathogenic strains, escalating pharmacological side effects, and the prohibitive cost of synthetic drugs have catalyzed a global resurgence of interest in phytotherapeutic agents [4-5]. Plant-derived secondary metabolites including alkaloids, flavonoids, tannins, terpenoids, and phenolic compounds exhibit broad-spectrum antimicrobial efficacy by disrupting microbial cell membranes, inhibiting efflux pumps, and suppressing nucleic acid synthesis [6-7]. Consequently, documenting ethnomedicinal flora through rigorous scientific investigation serves a dual purpose: preserving indigenous ecological knowledge before it erodes due to modernization, and discovering novel bioactive scaffolds for pharmaceutical drug development [8-9].

Yavatmal District, situated in the eastern Vidarbha region of Maharashtra, encompasses distinct undulating topography, tropical deciduous forests, and diverse floral habitats that sustain rich tribal communities such as the Korku, Kolam, Andh, and Gond. These communities possess specialized ethnobotanical wisdom regarding wild-growing medicinal plants capable of treating bacterial and fungal infections. Although isolated ethnobotanical surveys have been conducted across parts of Vidarbha, comprehensive documentation focusing specifically on ethnomedicinal plants with validated or potential antimicrobial properties within the diverse microclimates of Yavatmal District remains critically sparse [10-11].

Therefore, the present review aims to comprehensively synthesize and document ethnomedicinal plants traditionally utilized in Yavatmal District for treating microbial infections, evaluate their reported phytochemical profiles, and highlight their pharmacological potential as alternative antimicrobial leads. Local traditional healers, known locally as *Vaidus*, *Bhagats*, or *Ojhas*, hold empirical knowledge regarding the preparation of mono-herbal and poly-herbal formulations. Documenting these plant assets not only preserves fast-disappearing indigenous knowledge but also expedites pharmacological screening to combat drug-resistant pathogenic microbes.

2. Materials and Methods

Yavatmal district, spanning an area of 13,582 km², is characterized by a diverse geography and abundant natural resources. Geographically, it is situated in the eastern (Vidarbha) region of Maharashtra, lying between 19°26' to 20°42' North latitudes and 77°18' to 79°98' East longitudes. The region encompasses six major forest ranges: Yavatmal, Hiwri, Parwa, Ghatanji, Pandharkawda, and Wani. The total recorded forest cover in the district is approximately 2,508.01 km², accounting for 18.46% of its total geographical area. These forest landscapes are inhabited by indigenous tribal communities, notably the Gond and Kolam tribes. Historically, these communities have depended heavily on local forest resources for their livelihoods, traditional healing practices, and cultural sustenance, highlighting the profound ecological and socio-cultural importance of these six ranges. The dense forests, with their rich biodiversity of flora and fauna, play a vital role in shaping the local environment and rural economy, demonstrating the deep interconnectedness between indigenous populations and their surrounding ecosystem [12] (Figure 1).

Ethnomedicinal information was collected from tribal villagers and many ayurvedic or ethnomedicinal drugs practitioners were interacted for the study and documentation of their traditional knowledge about plants used to treat the microbial infection. Extensive field survey of different parts of the district was made along with the local tribal villagers and ethnomedicinal/ ayurvedic drug practitioner's perusal of published literature and herbarium specimen of different herbaria of the district was done to document

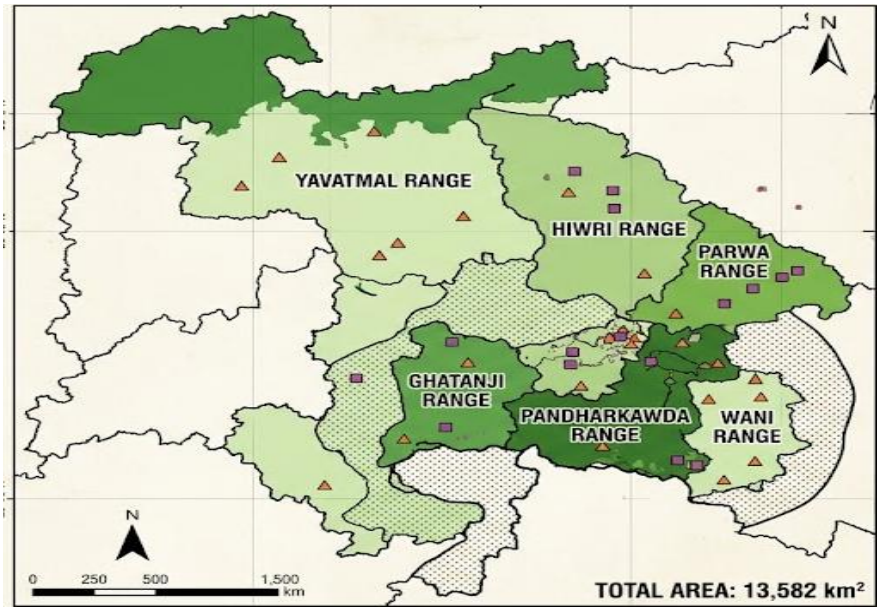

Figure 1: Study area

information following the methodology of Jain [2, 13], Martin [14-15], Bhogaonkar and Kadam [16]. Specimens were identified with the help of standard floras by taxonomy experts in Department of Botany, B.P. Science College, Digras and deposited in the herbarium of the same college.

3. Results and Discussion

The rural healers and traditional practitioners known locally as Vaidus and Bhagats across the six major forest ranges of Yavatmal District (Yavatmal, Hiwri, Parwa, Ghatanji, Pandharkawda, and Wani) retain deep empirical knowledge of local botanical resources. Indigenous communities such as the Gond and Kolam tribes utilize traditional formulations to manage diverse microbial and infectious ailments. These remedies range from simple mono-herbal leaf pastes (*Annona squamosa*, *Azadirachta indica*) to complex latex and bark extractions (*Calotropis gigantea*, *Terminalia arjuna*). Recent ethnobotanical investigations and literature syntheses conducted within this region document 15 ethnomedicinal plant species belonging to 14 distinct families. Modern pharmacological evaluations increasingly validate these traditional applications. Phytoconstituents such as alkaloids, flavonoids, tannins, and terpenoids present in these taxa exert synergistic antimicrobial effects by compromising microbial cell membrane integrity and inhibiting vital enzymatic pathways. Consequently, documenting these ethnomedicinal assets bridges traditional folklore with evidence-based phytotherapy, offering sustainable leads for novel drug discovery against multi-drug resistant microbial strains.

The documented medicinal flora of the Yavatmal region represents a broad taxonomic spectrum. Acanthaceae and Moraceae emerge as the most prominent families (contributing two species each), alongside single representatives from families such as *Amaranthaceae, Annonaceae, Papaveraceae, Meliaceae, Apocynaceae, Fabaceae, Lamiaceae, Combretaceae, Menispermaceae, Verbenaceae,* and *Asteraceae*. Therapeutic preparations rely on diverse botanical structures tailored to specific ailments. Leaves are the most frequently utilized part (found in 12 species), followed by bark and latex (utilized in species such as *Azadirachta indica*, *Calotropis gigantea*, *Ficus benghalensis*, and *Terminalia arjuna*), roots, and whole-plant extracts. Notably, the predominance of leaf-based drug preparations reflects an inherent, sustainable harvesting practice that minimizes ecological harm to wild populations, ensuring the long-term conservation of these vital forest resources.

Table 1: List of ethnomedicinal plants with antimicrobial activity in Yavatmal district

Scientific Name	Family	Local / Common Name	Plant Part(s) Used	Traditional Antimicrobial & Healing Uses
Achyranthes aspera L.	Amaranthaceae	Aghada	Whole plant, Leaves, Roots	Used traditionally for treating skin boils, wound healing, and dental/oral microbial infections.
Adhatoda vasica Nees.	Acanthaceae	Adulsa	Leaves	Extensively used for respiratory tract infections, cough, bronchitis, and bacterial pathogen inhibition.
Andrographis paniculata (Burm. f.) Nees	Acanthaceae	Olik / Kalmegh	Leaves, Whole plant	Highly valued by Kolam and Gond healers; exhibits powerful broad-spectrum antibacterial action against enteric and dermal pathogens.
Annona squamosa L.	Annonaceae	Sitaphal	Leaves, Seeds	Leaf pastes are widely used by local tribes for rapid wound healing and preventing secondary microbial infections.
Argemone mexicana L.	Papaveraceae	Bilayati Kateli / Patahi	Leaf, Root	Latex and root extracts are applied topically to treat skin eruptions, ulcers, and chronic wound infections.
Azadirachta indica A. Juss.	Meliaceae	Neem	Leaves, Bark, Seed oil	Widely recognized for potent broad-spectrum antibacterial, antifungal, and antiseptic properties; used for skin diseases and septic wounds.
Calotropis gigantea L.	Apocynaceae	Ruchki / Madar	Leaf, Latex	Latex is traditionally utilized for its antimicrobial and antimycotic action against fungal skin infections and boils.
Cassia fistula L	Fabaceae	Bahava / Purag	Bark, Leaves, Fruit pulp	Applied topically for fungal skin infections, ringworm, and secondary microbial complications in open wounds.
Ficus benghalensis L.	Moraceae	Wad / Vat	Latex, Bark	Milky latex is applied topically on pimples, dental cavities, and localized skin micro-infections.
Ficus hispida L.	Moraceae	Kagsha / Bhui-fig	Stem, Leaf, Root, Fruit	Used traditionally to treat skin infections, ulcers, and various microbial ailments; proven antibacterial and antifungal properties.
Ocimum americanum L.	Lamiaceae	Kali Tulsi / Wild Basil	Leaves	Rich in essential oils and phenolics; applied to control localized bacterial infections, dental issues, and skin eruptions.
Terminalia arjuna (Roxb.)	Combretaceae	Arjuna	Stem Bark	Bark extracts show profound inhibitory activity against bacterial strains tied to wound sepsis and pyogenic infections.
Tinospora cordifolia (Willd.) Miers	Menispermaceae	Gulvel / Amritavalli	Stem, Roots	Used to treat chronic fevers, stubborn skin ulcers, and internal microbial infections.
Vitex negundo L.	Verbenaceae	Nirgundi	Leaves	Applied as an anti-inflammatory and antimicrobial poultice for infected wounds, sores, and rheumatic swellings.
Xanthium strumarium L.	Asteraceae	Landga / Shankheshwar	Leaf, Root	Decoctions and leaf extracts are used to address stubborn microbial infections, malarial fevers, and sinusitis.

The findings of this ethnobotanical investigation within the Yavatmal District underscore the vital role that traditional empirical knowledge preserved by rural healers such as *Vaidus* and *Bhagats*, alongside indigenous communities like the Gond and Kolam tribes plays in primary rural healthcare. The documentation of 15 ethnomedicinal plant species across 14 distinct families highlights a rich localized pharmacopoeia utilized to combat diverse microbial and infectious challenges. These traditional practices reflect a deep, generations-old understanding of local forest ranges (including Yavatmal, Hiwri, Parwa, Ghatanji, Pandharkawda, and Wani) where remedies span from mono-herbal leaf pastes (*Annona squasma*, *Azadirachta indica*) to complex multi-part extractions (*Calotropis gigantea*, *Terminalia arjuna*) [17].

Taxonomic analysis of the documented flora reveals a prominent representation of families such as Acanthaceae and Moraceae. This taxonomic distribution aligns closely with broader regional floral surveys across Maharashtra's forest tracts, where adaptable indigenous shrubs and trees serve as primary mainstays for traditional pharmacopeias. Furthermore, the ecological distribution of plant parts utilized in this study demonstrates a strong preference for foliar applications [18]. This pattern highlights an inherent, sustainable harvesting ethic among indigenous practitioners [19]. By prioritizing leaves over destructive whole-plant extraction or debarking, local harvesting methods minimize ecological degradation and support the long-term conservation of wild populations.

Modern pharmacological evaluations increasingly validate these indigenous treatment modalities. The therapeutic efficacy observed in these botanical preparations is fundamentally tied to their secondary metabolite profiles. Phytoconstituents such as alkaloids, flavonoids, tannins, and terpenoids are well-documented for their multi-targeted antimicrobial properties. These active compounds typically disrupt microbial cell membrane permeability, chelate vital transition metal ions, and inhibit key microbial enzymatic pathways. For instance, the widespread use of *Azadirachta indica* and *Terminalia arjuna* corresponds with extensive phytochemical literature confirming their broad-spectrum bacteriostatic and bactericidal actions against multi-drug resistant strains [20].

4. Conclusion

This study successfully documents 15 ethnomedicinal plant species across 14 families utilized by traditional healers and indigenous communities in the Yavatmal district of Maharashtra for managing microbial infections. The predominant use of leaves underscores a sustainable approach to traditional healthcare that protects local forest ecosystems. Coupled with modern phytochemical evidence confirming the presence of active antimicrobial metabolites, these findings validate centuries-old indigenous practices. Preserving this botanical lore bridges traditional folklore with evidence-based medicine, offering vital leads for future pharmaceutical research against drug-resistant pathogens.

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