Medicinal flora of Melghat for Bronchitis: A Review

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DOI: https://doi.org/10.22271/phyto.2023.v12.i1a.14542

Abstract
Bronchitis is among the top 10 conditions for which patients look for medication. The expanding burden of chronic infections is a specific risk in developing countries. The current review focuses on medicinal plants from the Melghat region used to cure Bronchitis. A total of 118 medicinal plant species from Melghat flora distributed among 104 genera and 53 families have compiled for Bronchitis. The most frequently reported plant families were Asteraceae (14), followed by Euphorbiaceae (07), Malvaceae (07), Cucurbitaceae (06), Solanaceae (05), Verbenaceae (05), Asclepiadaceae (04), Asteraceae (04), etc., in this study. Out of 118 species reviewed, Herbs represented 31% of species, followed by Trees (30%), Shrubs (26%), Climbers (10%), and Orchids (3%). The most commonly used plant part in ailments was Leaves (24%), followed by Whole plant (19%), Bark (14%), Roots (13%), Fruits (8%), Seeds (8%), Flowers (3%), etc. Curated data presented as plant's botanical name, plant's family, habit, ailments, and part in use with relevant traditional, folk, and ethnobotanical uses patterns with cross citations. This review offers scope for the researchers engaged in drug discovery and development.

Keywords: Bronchitis, respiratory infections, herbal medicine, Melghat flora, ethnomedicine.

1. Introduction
Melghat means "meeting of ghats" which is the region that lies in the south-western Satpura mountain ranges in the compact block of Amravati district in the state of Maharashtra, India, and it is best known for Melghat Tiger Reserve (MTR). Melghat forest has a unique ecological niche [1], mostly of the dry mixed deciduous type vegetation [2], and is conserved due to MTR. It has always been an area of interest for nature researchers. Many botanists [3, 4] and other researchers contributed to identifying the plant species and strengthening the "Flora of Melghat" [5-9]. During the past several decades, various ethnobotanical surveys [7-22] have been conducted on an individual and institutional basis to collect traditionally used plant information for various ailments. Recently, "Checklist of Flora of Melghat" [23] and "Digitization of Flora of Melghat" [24, 25, 26, 27] was published.

Respiratory infections continue to be ordinary human illnesses like colds, coughs, viral pharyngitis, bronchitis, and influenza [28]. Bronchitis occurs when the bronchi (bronchial tubes) that carry air in your lungs become inflamed [29]. Bronchitis can be acute (short-lived) or chronic (long-lived). Acute Bronchitis is usually due to a viral infection (e.g., Respiratory syncytial virus, Para-influenza & Influenza virus, Adenovirus, Measles virus, etc.). The common symptoms are a cough that produces yellow or green mucus, wheezing, a burning sensation in the chest, chest congestion, breathlessness, sore throat, fatigue, and fever. Acute Bronchitis usually lasts for a few days, but you may have a cough for weeks afterward [29, 30].

An interaction between noxious inhaled agents causes chronic Bronchitis (occurs most often in people who smoke) and host factors (e.g. genetic and respiratory infections) that result in chronic inflammation and are known as Chronic Obstructive Pulmonary Disease (COPD) [31, 32]. Chronic Bronchitis is characterized by a productive (wet) cough that produces mucus (persistent), wheezing, shortness of breath, blue-tinged lips, ankle, feet, and leg swelling [33]. Worldwide, 40% of smokers during their lifetime develop chronic Bronchitis.

Herbal medicine is a time-honored approach, to treating disease and strengthening the body. In the History of medicine, folk, traditional, and ethnic practices to cure different ailments, back practically to human civilization [34]. Ayurveda remains dominant compared to modern medicine, particularly for treating a variety of chronic disease conditions [35]. In Ayurvedic medicine, leaves of Andrographis paniculata Wall (Family: Acanthaceae) are reported in various herbal formulations for the common cold, cough, sore throat, and bronchitis [36].

Antibiotic therapy is a mainstay of treatment for mild and moderate bronchitis. If the infection is severe or the patient is critically ill, you may be treated with anti-inflammatory and analgesic medications [37]. Pranarom (Plant name: Pranarom) is a private company that has explored the use of aromatic plants for medicinal purposes and has launched a range of products with therapeutic benefits. Pranarom's products are based on traditional ayurvedic formulations and are used to treat various ailments, including respiratory infections and bronchitis.
The present review has been undertaken to generate scientific baseline data to provide traditional and complementary remedies for Bronchitis.

2. Methods
2.1 Data Retrieval
Data presented in this review encompasses plant species found in Melghat used to treat Bronchitis. It also includes information about botanical names, plant families, plant categories, and parts used for Bronchitis with the related reference(s) cited. Pre-defined criteria were taken into consideration for selecting the research articles. The published literature and information obtained from international scientific databases such as PubMed, PubMed Central, Medline, Science Direct, Scopus, Google Scholar, Research Gate, and Web of Science were reviewed. The plant’s botanical name, synonyms, and families were verified using books, research articles, and publicly available online sources. The identity of the used herbal preparations was considered, including the used plant parts.

2.2 Data Analysis
The literature was reviewed; qualitative and quantitative data were analyzed through statistical tools and presented in graphs and tables. The findings offer the reasons for pharmacological screenings, future conservations, and scope for researchers to explore further drug discovery and development.

3. Results
The present outcomes are extensive literature findings for medicinal plants from Melghat flora used for Bronchitis, folk, traditional, and ethnobotanical-related citations (Table 1). Both published and unpublished research articles were used to systematize the review.

A total of 118 medicinal plants from Melghat flora used for Bronchitis belong to 104 genera, and 53 plant families are found in cross-references. The most dominant genus was Abelmoschus, and Solanum contains three species each, followed by Albizia, Barleria, Calotropis, Desmodium, Euphorbia, Ficus, Lecias, Polygala, Terminalia, and Urena each containing two species, and the rest 92 genus contain single species. The most commonly used plants for Bronchitis were the member of Asteraceae (14 sp. i.e. 12%), followed by Euphorbiaceae (07 sp. i.e. 6%), Malvaceae (07 sp. i.e. 6%), Cucurbitaceae (06 sp. i.e. 5%), Solanaceae (05 sp. i.e. 4%), Verbenaceae (05 sp. i.e. 4%), Asclepiadaceae (04 sp. i.e. 3%), Asteraceae (04 sp. i.e. 3%), 5 plant families contain 3 species each, 11 plant families contain two species each and 29 plant families contain one species.

The distribution of the species used for Bronchitis as is herbs (31.35%), followed by trees (29.67%), shrubs (26.28%), climbers (10.17%), and orchids (2.54%) represented in figure 1. Reviewed data for 18 reported plant parts to prepare herbal remedies for Bronchitis are presented in figure 2. The presented data shows leaves (38) are mostly used to prepare herbal remedies for Bronchitis traditionally, followed by the whole plant (30), bark (22), roots (21), fruits (13), seeds (13), fruits (4), gum, rhizomes, root bark, stem, tubers used twice and aerial parts, berries, oil, sap (leaf), stem bark and wood used once respectively in herbal preparation as remedies for Bronchitis. Whereas two plants are reported as used against Bronchitis but which part used is unspecified.

4. Discussion
Melghat region is a unique ecological niche and is enriched with huge medicinal flora. This literature review revealed 118 medicinal plants from this biodiversity-rich part of Maharashtra in India. More specifically, it has a significant number of plant species used as herbal remedies for Bronchitis. The authors intended to document the ethnobotanical, indigenous practices, and traditionally used remedies, and it serves as scientific baseline findings for researchers engaged in herbal drug discovery and development. All the plants reviewed exhibited potent activity confirming their various traditional, folk, and ethnobotanical uses and their ability to treat Bronchitis. Further, pharmacological screening, isolating active compounds, herbal formulations, and their action mechanisms need to be studied.

Table 1: Melghat medicinal plants used for bronchitis

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Medicinal plant's name</th>
<th>Plant's family</th>
<th>Category</th>
<th>Part Used</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Abelmoschus manihot (L.) Medik.</td>
<td>Malvaceae</td>
<td>Shrubs</td>
<td>Flowers, Leaves</td>
<td>[43, 44, 45]</td>
</tr>
<tr>
<td>2</td>
<td>Abrus precatorius L.</td>
<td>Asclepiadaceae</td>
<td>Shrubs</td>
<td>Leaves</td>
<td>[46]</td>
</tr>
<tr>
<td>3</td>
<td>Abutilon hirtum (lam.) Sweet</td>
<td>Malvaceae</td>
<td>Shrubs</td>
<td>Leaves</td>
<td>[47]</td>
</tr>
<tr>
<td>4</td>
<td>Acacia nilotica (L.) Dehile</td>
<td>Mimosoideae</td>
<td>Tree</td>
<td>Bark</td>
<td>[48, 49]</td>
</tr>
<tr>
<td>5</td>
<td>Acacia pennata (L.) Willd.</td>
<td>Asteraceae</td>
<td>Shrubs</td>
<td>Bark</td>
<td>[49]</td>
</tr>
<tr>
<td>6</td>
<td>Acacia torta (Roxb.) Crab</td>
<td>Asteraceae</td>
<td>Clusters</td>
<td>Leaves</td>
<td>[49]</td>
</tr>
<tr>
<td>7</td>
<td>Acylophia indica L.</td>
<td>Euphorbiaceae</td>
<td>Herbs</td>
<td>Leaves</td>
<td>[40, 46, 47, 48]</td>
</tr>
<tr>
<td>8</td>
<td>Achyranthes aspera L.</td>
<td>Amaranthaceae</td>
<td>Herbs</td>
<td>Whole plant, Roots</td>
<td>[49, 50]</td>
</tr>
<tr>
<td>9</td>
<td>Aegle marmelos L.</td>
<td>Rutaceae</td>
<td>Tree</td>
<td>Leaves</td>
<td>[46]</td>
</tr>
<tr>
<td>10</td>
<td>Agave americana L.</td>
<td>Agavaceae</td>
<td>Herbs</td>
<td>Sap(Leaf)</td>
<td>[50]</td>
</tr>
<tr>
<td>11</td>
<td>Alantus excelsa Roxb.</td>
<td>Simaroubaceae</td>
<td>Tree</td>
<td>Bark</td>
<td>[44, 45]</td>
</tr>
<tr>
<td>12</td>
<td>Albizia lebbeck (L.) Benth.</td>
<td>Asteraceae</td>
<td>Tree</td>
<td>Bark, Roots</td>
<td>[50]</td>
</tr>
<tr>
<td>13</td>
<td>Albuza odoratissima (L. F.) Benth.</td>
<td>Asteraceae</td>
<td>Tree</td>
<td>Bark</td>
<td>[50]</td>
</tr>
<tr>
<td>14</td>
<td>Alstonia scholaris (L.) R. Br.</td>
<td>Apocynaceae</td>
<td>Tree</td>
<td>Bark</td>
<td>[50]</td>
</tr>
<tr>
<td>15</td>
<td>Amaranthus spinosus L.</td>
<td>Amaranthaceae</td>
<td>Herbs</td>
<td>Whole plant</td>
<td>[40, 51]</td>
</tr>
<tr>
<td>16</td>
<td>Amorphophallus paeoniifolius (Dennst.) Nicolson</td>
<td>Araceae</td>
<td>Herbs</td>
<td>Roots</td>
<td>[51, 55]</td>
</tr>
<tr>
<td>17</td>
<td>Andrographis paniculata (Burm. F.)</td>
<td>Acanthaceae</td>
<td>Herbs</td>
<td>Whole plant, Leaves</td>
<td>[56, 57]</td>
</tr>
<tr>
<td>18</td>
<td>Apium graveolens Linn.</td>
<td>Apiaceae</td>
<td>Herbs</td>
<td>Leaves, Seed, Roots</td>
<td>[44, 53]</td>
</tr>
<tr>
<td>19</td>
<td>Acanza lampa (Cav.) Afel.</td>
<td>Malvaceae</td>
<td>Shrubs</td>
<td>Stems</td>
<td>[50]</td>
</tr>
<tr>
<td>20</td>
<td>Baliospermum montanum (Willd.)</td>
<td>Euphorbiaceae</td>
<td>Shrubs</td>
<td>Leaves</td>
<td>[48]</td>
</tr>
<tr>
<td>21</td>
<td>Barleria cristata L.</td>
<td>Acanthaceae</td>
<td>Shrubs</td>
<td>Roots, Whole plant</td>
<td>[42, 43, 45]</td>
</tr>
<tr>
<td>22</td>
<td>Barleria prionitis L.</td>
<td>Acanthaceae</td>
<td>Shrubs</td>
<td>Leaves, Roots, Whole plant</td>
<td>[42, 43, 46]</td>
</tr>
<tr>
<td>23</td>
<td>Biophytum sensitivum (L.) DC.</td>
<td>Oxalidaceae</td>
<td>Herbs</td>
<td>Leaves</td>
<td>[46]</td>
</tr>
<tr>
<td>24</td>
<td>Blumea lacera (Burm. F.) DC.</td>
<td>Acanthaceae</td>
<td>Herbs</td>
<td>Leaves, Whole plant</td>
<td>[52]</td>
</tr>
<tr>
<td>25</td>
<td>Boerhavia diffusa L.</td>
<td>Nyctaginaceae</td>
<td>Herbs</td>
<td>Whole plant, Leaves, Roots</td>
<td>[43, 45, 46, 49, 50]</td>
</tr>
<tr>
<td>26</td>
<td>Bombax ceiba L.</td>
<td>Malvaceae</td>
<td>Tree</td>
<td>Bark</td>
<td>[50]</td>
</tr>
<tr>
<td>27</td>
<td>Bosswellia serrata Roxb.</td>
<td>Burseraceae</td>
<td>Tree</td>
<td>Oil, Bark, Fruit, Gum</td>
<td>[44, 45]</td>
</tr>
</tbody>
</table>
Fig 1: Number of plants and categories used for bronchitis

Fig 2: Plant parts that are used for bronchitis

5. Authors' Contributions
All the authors have contributed equally in conducting research work and in writing a research paper. All authors read and approved the final manuscript.

6. Competing interests
The authors declare that they have no competing interests.

7. Consent for publication
Not applicable.

8. Ethics approval and consent to participate
Not applicable.

9. Funding
Not applicable.
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