Medicinal species of Fabaceae occurring in Bangladesh and their conservation status

Ishrath Jahan, MA Rahman and MA Hossain

Abstract

Research work has been carried out to assess the number of total medicinal species of Fabaceae and evaluate their status in the flora of Bangladesh. The family has revealed significant richness with 169 (i.e. 67%) medicinal species under 61 genera among 254 total species under 69 genera. A total of 62 medicinal species are assessed to be threatened under different categories set by International Union for Conservation of Nature and Natural Resources (IUCN) due to environmental degradation, over exploitation and depletion of ecosystem diversity. Among them, 33 endangered, 7 critically endangered, 6 vulnerable and 16 rare. Out of 169 medicinal species of the family Fabaceae, 25 genera are represented by single species in the flora of Bangladesh. Among these 25 genera, 7 i.e., 28% are threatened. The study is based on long-term field investigations, examination of herbarium specimens and survey of relevant floristic and medicinal literature.

Keywords: Medicinal plant, threatened species, conservation, fabaceae, Bangladesh

1. Introduction

Now a day’s numerous medicinal plants are used to cure several diseases in developing countries. The aromatic medicinal plants are containing large amount of secondary metabolites and essential oils of traditional and therapeutic importance. So many desirable drugs are isolated from various types of plant parts like root, leaf and stem. Several local people still depended on the medicinal plants for their primary healthcare and treatment of various diseases (Samydurai et al. 2012) [76]. The important advantages claimed for therapeutic uses of medicinal plants in various ailments are their safety besides being economical, effective and their easy availability (Atal and Kapoor 1989) [7].

The family Fabaceae consists of about 483 genera and 12,000 species (Lewis et al. 2005) [48]. In Bangladesh, it is represented by 69 genera and 254 species (Ahmed et al. 2009) [31]. With regard to medicinal uses, it has been pointed out that, Fabaceae are found amongst the five botanical families richest in therapeutic properties in the pharmacopoeia of indigenous and rural populations in Holarctic, Neotropical and Sub-Antarctic regions. In particular, it has been found that the family Fabaceae is second in importance to Asteraceae in terms of richness of medicinal taxa. Their medicinal value lies partly in their effectiveness in the treatment of a wide variety of human ailments. The variety of chemically active constituents, such as tannins, flavonoids, alkaloids and terpenes often found in members of this family, are substances with a high level of biological activity.

The international market of medicinal plants related trade showed that, the use of these plants had a growth rate of 7% per annum and the annual cost of usage of these plants is valued as 1200 million (Jose et al.2001) [37]. According to Sarasan et al. (2006) [77], more than eight thousand plant species were added to the RED list of Threatened Species during the period 1996-2004 by International Union for Conservation of Nature and Natural Resources (IUCN). During the same period, these authors noted that the number of plants recorded as “critically endangered” are increased by over 60%. IUCN and the World Wildlife Fund (WWF) estimated that up to 60,000 higher plant species could become extinct or nearly extinct by the year 2050, if the current trends of utilization continue (Etkin 1998; Phani Kumar et al. 2011) [19, 50].

The increased commercialization has resulted in overharvesting of some medicinal plants, many of which have become threatened. Threatened medicinal plant species have become the focus of world attention because they represent vanishing flora in need of protection and conservation and because of their role as an essential commodity for health care
the present investigation was carried out to explore the abundance of medicinal species of Fabaceae and assessment of rare, critically endangered, endangered and vulnerable (RED list) species in Bangladesh. These kinds of plants are in need of proper conservation and management plans for its medicinal properties and medicinal plant resources before it lost forever.

2. Materials and Methods
Assessment of the threatened medicinal taxa has been made to the family Fabaceae of Bangladesh through field investigations, examination of the collected herbarium specimens and consultation of the relevant floristic literature. The filed investigations, collection of specimens and field data, determination of status of occurrence, documentation of conservation status have been made by repeated field visits throughout the flora. The places of occurrence of the previously recorded taxa has been documented by consulting Roxb. (1814, 1824, 1832) [72, 74, 75], Wall. (1828-49) [80], Hook. f. (1872-1897) [60], Kurz (1877) [47], Prain (1903) [51], Heinig (1925) [23], Cowan (1929) [13], Raizada (1941) [69], Datta and Mitra (1953) [15] and Sinclair (1956) [79].

The previously collected specimens of the Fabaceae preserved in different herbaria of Bangladesh, viz., Bangladesh National Herbarium (BNH), Dhaka University Salar Khan Herbarium (DUSH), Bangladesh Forest Research Institute Herbarium (BFRIH), Herbarium, Bangladesh Council of Scientific and Industrial Research (BCSIRH), Herbarium of Chittagong University (HCU) and in international herbaria, viz., British Museum (BM), Calcutta Herbarium (CAL), have been examined critically to record the data of each species. The relevant and up to date floristic literature published since Sinclair (1956) [79], such as, Khan and Afza (1968) [62], Khan and Banu (1972) [61], Huq and Begum (1984) [28], Huq and Khan (1984) [29], Khan et al. (1984) [41], Naderuzzaman and Islam (1984) [49], Alam (1988, 1995) [2], Huq (1988) [27], Khan et al. (1994) [45], Rahman and Hassan (1995) [66], Rahman and Uddin (1997) [60], Yusuf et al. (1997) [68], Dey et al. (1998) [17], Uddin et al. (1998, 2002, 2003) [80, 81, 82], Uddin and Rahman (1999) [65], Das and Alam (2001) [14], Khan and Huq (2001) [40], Rashid and Mia (2001) [70], Rashid et al. (2001) [79], Uddin and Hassan (2004, 2010, 2002) [80, 81, 84], Hussain et al. (2005) [25], Alam et al. (2006) [3], Momen et al. (2006) [90], Islam et al. (2009) [53], Barbhuiya and Gogoi (2010) [10], Rahman et al. (2010, 2010a, 2012, 2013, 2016) [63, 64, 67, 68], Rahman and Jahan (2016) [57], Tutul et al. (2010) [79], Rahman and Hasan (2015) [60], Arefin et al. (2011) [6], Uddin et al. (2013) [63], have been surveyed to trace the report of collection/occurrence of the taxa of the Fabaceae. The assessment and recognition of the taxa as threatened is based on the criteria of IUCN (IUCN 2012) [34].

Determination of the recorded species as medicinal have been made by consulting medicinal books and published articles, e.g., Dunn (1912) [18], Gillett (1958) [22], De Kort and Thijsse (1984) [16], Ambasta (1986) [4], Kaur and Kapoor (1990) [39], Jain (1991) [36], Ghani (2003) [21], Yusuf et al. (2009) [88], Kim et al. (2010) [46], Quattr. (2012) [54] and Rahman and Asfaq (2012) [59].

3. Result and Discussions
Inventory of the medicinal species of Fabaceae for determining their conservation status in the flora revealed that out of 254 species of the family, 169 i.e., 67% species under 61 genera are medicinal, 85 species have no medicinal properties. 62 medicinal species under 26 genera are threatened under different IUCN categories. In total threatened species, 16 are rare and conservation dependent, 6 vulnerable, 33 endangered and 7 critically endangered. Examination of the herbarium specimens of the Fabaceae of Bangladesh preserved at BNH, DUSH, HCU, BFRIH, BCSIRH, BM and CAL revealed that they are very limited in their distribution. Out of 169 medicinal species, 25 genera are represented by single species in the flora of Bangladesh. Among these 25 genera, 7 i.e., 28% threatened, 15 i.e., 60% cultivated and only 3 i.e., 12% are common (shown in fig. 1).

![Fig 1: Pie chart showing status of genera represented by single species](image1)

![Fig 2: Pie chart showing status of the medicinal species of Fabaceae.](image2)
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Species</th>
<th>Habit</th>
<th>Status of occurrence</th>
<th>Medicinal use</th>
<th>Medicinal properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alysicarpus rugosus</td>
<td>Shrub</td>
<td>EN</td>
<td>Skin complaints, Rheumatism</td>
<td>Anti-rheumatic</td>
</tr>
<tr>
<td>2</td>
<td>Aeschynomene americana L.</td>
<td>Climbing shrub</td>
<td>EN</td>
<td>Bacterial infection, also used for poisoning</td>
<td>Antibacterial, Toxic</td>
</tr>
<tr>
<td>3</td>
<td>Alysicarpus bupleurifolius (L.) Polhill</td>
<td>Herb</td>
<td>R</td>
<td>Asthma, Fever, Wounds</td>
<td>Anti-septic</td>
</tr>
<tr>
<td>4</td>
<td>Alysicarpus rugosus (Willd.) DC.</td>
<td>Herb</td>
<td>EN</td>
<td>Cough, Dropy, Edema, Fever, Guinea worm, Headache Indigestion, Pulmonary</td>
<td>Astringent, Emetic, Febrifuge</td>
</tr>
<tr>
<td>5</td>
<td>Cajanus crassa (Prain &amp; King) van der Maesen</td>
<td>Climbing Shrub</td>
<td>EN</td>
<td>Jaundice, Piles, Mumps</td>
<td>Anti-viral</td>
</tr>
<tr>
<td>6</td>
<td>Cajanus goensis Dalz.</td>
<td>Woody climber</td>
<td>EN</td>
<td>Rheumatism, Impure blood, Bilioussness, Fever, Swellings</td>
<td>Anti-rheumatic</td>
</tr>
<tr>
<td>7</td>
<td>Canavalia maritima Thou.</td>
<td>Climber</td>
<td>CR</td>
<td>Boils, Cold, Labor, Leprosy, Malaria, Poisonous, Rheumatic pain</td>
<td>Aphrodisiac, Antirheumatic, Tonic, Toxic</td>
</tr>
<tr>
<td>8</td>
<td>Crotalaria alata D. Don</td>
<td>Herb</td>
<td>VU</td>
<td>Abscesses, Bedwetting, Boils, To help Digestion, Fever, Labor, Snakebite</td>
<td>Antidote, Toxic</td>
</tr>
<tr>
<td>9</td>
<td>Crotalaria albidta Heyne ex Roth</td>
<td>Herb</td>
<td>EN</td>
<td>Chronic back pain, Indigestion, Wart on the sole</td>
<td>Antibacterial, Purgative, Tonic</td>
</tr>
<tr>
<td>10</td>
<td>Crotalaria bracteata Roxb. ex DC.</td>
<td>Shrub</td>
<td>EN</td>
<td>Used for medicinal purposes in Comboa (Thuan 1987, from ILDIS database)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Crotalaria cytisoides Roxb. ex DC.</td>
<td>Shrub</td>
<td>EN</td>
<td>Cut and wounds</td>
<td>Anti-septic</td>
</tr>
<tr>
<td>12</td>
<td>Crotalaria laburnifolia L.</td>
<td>Shrub</td>
<td>EN</td>
<td>Helminthiasis, Skin fungus</td>
<td>Anti-fungal</td>
</tr>
<tr>
<td>13</td>
<td>Crotalaria nana Burm. f.</td>
<td>Herb</td>
<td>EN</td>
<td>Diarrhoea</td>
<td>Anti-diarrheal</td>
</tr>
<tr>
<td>14</td>
<td>Crotalaria prostrata Roottler ex Willd.</td>
<td>Herb</td>
<td>VU</td>
<td>Bleeding, Delivery, Diarrhoea, Fever, Gout, Postpartum remedy, Skin disease, Stomach disorder</td>
<td>Anti-fungal, Anti-septic, Derangement</td>
</tr>
<tr>
<td>15</td>
<td>Crotalaria quinquefolia L.</td>
<td>Herb</td>
<td>EN</td>
<td>Fever, Impetigo, Lung diseases, Scabies</td>
<td>Anti-microbial, Toxic</td>
</tr>
<tr>
<td>16</td>
<td>Crotalaria retusa L.</td>
<td>Under shrub</td>
<td>R</td>
<td>Coughing up blood, Cold, Fever, Impetigo, Lung diseases, Skin infection, Scabies, Thrush, Skin eruptions, Skorpion bite, Urinary problem</td>
<td>Abortifacient, Analgesic, Anti-septic, Febrifuge CNS depressant, Emetic, Laxative, Spasmolytic, Hepatotoxic, Vermifuge</td>
</tr>
<tr>
<td>18</td>
<td>Dalbergia latifolia Roxb.</td>
<td>Tree</td>
<td>EN</td>
<td>Dyspepsia, Diarrhoea, Leprosy, Obesity, Worms</td>
<td>Antihelminitic, Stomachic, Stimulant, Spasmogenic, Tonic</td>
</tr>
<tr>
<td>19</td>
<td>Dalbergia lanceolaria L.f.</td>
<td>Tree</td>
<td>R</td>
<td>Dyspepsia, Jaundice, Menorrhagia, Rheumatism</td>
<td>Analgesic, Anti-arthritis, Anti-diarrheal and Anti-inflammatory</td>
</tr>
<tr>
<td>20</td>
<td>Dalbergia pinnata (Lour.) Prain</td>
<td>Woody climber</td>
<td>R</td>
<td>Nervous complaints, Skin disorder, Varicose veins</td>
<td>Antihelminitic, Vermifuge</td>
</tr>
<tr>
<td>21</td>
<td>Dalhouisia bracteata (Roxb.) Grabin ex Benth.</td>
<td>Shrub</td>
<td>EN</td>
<td>Fresh cuts</td>
<td>Antiseptic</td>
</tr>
<tr>
<td>22</td>
<td>Dendrolobium triangulare (Retz.) Merr.</td>
<td>Shrub</td>
<td>EN</td>
<td>Snakebite, Strengthening bones and building muscles, Poisonous</td>
<td>Antidote, Emitic, Toxic</td>
</tr>
<tr>
<td>23</td>
<td>Dendrolobium umbellatum (L.) Benth.</td>
<td>Shrub</td>
<td>EN</td>
<td>Enlarged spleen, Fever, Headache, Malaria</td>
<td>Antibacterial, Antimycobacterial, Astringent, Tonic</td>
</tr>
<tr>
<td>24</td>
<td>Derris cuneifolia Benth.</td>
<td>Woody climber</td>
<td>EN</td>
<td>Poisonous to fish</td>
<td>Toxic</td>
</tr>
<tr>
<td>25</td>
<td>Derris elegans Benth. var. vestita (Baker) Prain</td>
<td>Woody climber</td>
<td>EN</td>
<td>Snakebite, used for poisoning</td>
<td>Antidote, Toxic</td>
</tr>
<tr>
<td>26</td>
<td>Derris ferruginea (Roxb.) Benth.</td>
<td>Woody climber</td>
<td>CR</td>
<td>Poisonous to fish</td>
<td>Toxic</td>
</tr>
<tr>
<td>27</td>
<td>Deris trifoliata Lour.</td>
<td>Climbing shrub</td>
<td>R</td>
<td>Chronic dysentery, Chronic paralysis, Dysmenorrhoea, Fever, Rheumatism, Sores, Fish poison</td>
<td>Anti-spasmodic, Anti-septic, Anti-rheumatic, Anti-arthritis, Carminative, Counter irritant, Cytotoxic, Insecticidal, Laxative, Stimulant, Toxic</td>
</tr>
<tr>
<td>No.</td>
<td>Scientific Name</td>
<td>Family</td>
<td>Status</td>
<td>Habitat</td>
<td>Uses, Effects</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>31.</td>
<td><em>Desmodium velatum</em> (Willd.) DC.</td>
<td>Undershrub</td>
<td>R</td>
<td>Blood in urine, Diarrhoea, Toothache</td>
<td>Anti-diarrheal, Stimulent</td>
</tr>
<tr>
<td>32.</td>
<td><em>Dunbaria glandulosa</em> (Dalz.) Prain</td>
<td>Woody climber</td>
<td>EN</td>
<td>Sterility</td>
<td>Anti-sterility</td>
</tr>
<tr>
<td>34.</td>
<td><em>Flemingia chappar</em> Buch. – Ham. ex Benth.</td>
<td>Shrub</td>
<td>EN</td>
<td>Cataract, Diarrhoea, Dysentery, Bodyache, Epilepsy, Eye trouble, Fever, Indigestion, Intestinal worm, Spermatorrhoea</td>
<td>Anti-diarrheal, Toxic</td>
</tr>
<tr>
<td>35.</td>
<td><em>Flemingia stricta</em> Roxb.</td>
<td>Shrub</td>
<td>EN</td>
<td>Asthma, Fever, Menstrual irregularities</td>
<td>Anti-cholinergic, Contraceptive</td>
</tr>
<tr>
<td>36.</td>
<td><em>Indigofera hirsuta</em> L.</td>
<td>Herb</td>
<td>R</td>
<td>Used for poisoning</td>
<td>Toxic</td>
</tr>
<tr>
<td>37.</td>
<td><em>Indigofera linifolia</em> (L. f.) Retz.</td>
<td>Herb</td>
<td>CR</td>
<td>Amennorhoea, Boils, Bowel complaints, Febrile eruptions, Fractured bone, Liver diseases, Menstrual troubles, Scorpion bite, Sores and Wounds</td>
<td>Laxative, Toxic</td>
</tr>
<tr>
<td>38.</td>
<td><em>Indigofera linnaei</em> Ali</td>
<td>Herb</td>
<td>EN</td>
<td>Dandruff, Sprue, Wounds</td>
<td>Purgative</td>
</tr>
<tr>
<td>39.</td>
<td><em>Indigofera prostrata</em> Wildl.</td>
<td>Shrub</td>
<td>EN</td>
<td>Leucorrhea, Rheumatism</td>
<td>Anti-rheumatic, Nutritive, Restorative, Tonic</td>
</tr>
<tr>
<td>41.</td>
<td><em>Indigofera trita</em> L. f.</td>
<td>Woody herb</td>
<td>EN</td>
<td>Impaction in animals</td>
<td>Laxative</td>
</tr>
<tr>
<td>42.</td>
<td><em>Medicago polymorpha</em> L.</td>
<td>Herb</td>
<td>R</td>
<td>Cancer, Tumor</td>
<td>Anti-oxidant, Anti-cancer, Cytotoxic</td>
</tr>
<tr>
<td>44.</td>
<td><em>Millettia extensa</em> (benth.) Baker</td>
<td>Woody climber</td>
<td>CR</td>
<td>Used for poisoning, Menstrual problems</td>
<td>Toxic, Contraceptive</td>
</tr>
<tr>
<td>45.</td>
<td><em>Millettia pachycarpa</em> Benth.</td>
<td>Shrub</td>
<td>R</td>
<td>Poisonous to human</td>
<td>Toxic</td>
</tr>
<tr>
<td>46.</td>
<td><em>Mucuna bracteata</em> DC. ex Kurs</td>
<td>Climber</td>
<td>VU</td>
<td>Bacterial infection</td>
<td>Anti-microbial</td>
</tr>
<tr>
<td>47.</td>
<td><em>Mucuna gigantea</em> (Willd.) DC.</td>
<td>Woody climber</td>
<td>R</td>
<td>Poisonous, Pod hair causes irritation</td>
<td>Toxic</td>
</tr>
<tr>
<td>48.</td>
<td><em>Mucuna macrocarpa</em> Wall.</td>
<td>Woody climber</td>
<td>EN</td>
<td>Sprains</td>
<td>Anti-inflammatory</td>
</tr>
<tr>
<td>49.</td>
<td><em>Mucuna nigricans</em> (Lour.) Steud.</td>
<td>Climbing Shrub</td>
<td>EN</td>
<td>Causes Dermatitis, Itching, Irritation, used for Asthma, Cholera, Cough, Fever, Snakebite, Throat pain, Ulcer of genital organs of both sex</td>
<td>Toxic, Vermifuge</td>
</tr>
<tr>
<td>50.</td>
<td><em>Pterocarpus marsupium</em> Roxb.</td>
<td>Tree</td>
<td>EN</td>
<td>Asthma, Cough, Diabetes, Graying hair, Heart disease, Jaundice, Menorrhagia, Skin disease</td>
<td>Astringent, Anti-inflammatory</td>
</tr>
<tr>
<td>52.</td>
<td><em>Pueraria lobata</em> (Willd.) Ohwi.</td>
<td>Climbing shrub</td>
<td>VU</td>
<td>Chicken pox</td>
<td>Anti-viral</td>
</tr>
<tr>
<td>53.</td>
<td><em>Pueraria peduncularis</em></td>
<td>Climbing</td>
<td>EN</td>
<td>Used for poisoning</td>
<td>Toxic plant</td>
</tr>
</tbody>
</table>
4. Conclusion
The result of examination and determination of all collected specimens of the Fabaceae, and survey of local floristic literature although suggests that 7 species under critically endangered (CR) category, 33 species under endangered (EN) category, 6 under vulnerable (VU) category and 16 under rare (R) category. These species are closely related with local community and also drug industries. Over exploitation of these species may cause drastic change of nature. By conducting awareness program among the people, we can promote the knowledge about importance of diversity and also can conserve the threatened plants. Further survey, both extensive and intensive, is to be conducted throughout the flora of Bangladesh which may result in reconfirmation of their status of occurrence and to undertake appropriate conservation management like in-situ and ex-situ.

5. Acknowledgement
The authors are grateful to the authority of the BNH, DUSH, BFRIH, BCSIRH and HCU for providing herbarium specimens.

6. Reference
34. IUCN Red List. IUCN Red List Version. 4: Table 5. Threatened species in each country (totals by taxonomic groups), 2010.