Traditional knowledge and use of medicinal plants: a case study from Joshimath block of Chamoli Uttarakhand

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Abstract
The rural communities living in remote areas of Uttarakhand, have their own way of living with in social and cultural moorings. Irrespective of their simplicity and complexity, these communities holds rich traditional knowledge on medicinal plants. The interviews were collected in local dialect to avoid translation problem. The interviews were conducted through structured questionnaires to obtain information on medicinal plants, including local name, name of the disease for which the plant is used and mode of preparation, part of the plant used etc.

A total of 53 plant species were recorded in the study area. Among the medicinal plants, the recorded species of trees, shrubs, herbs, lichens and fungi are 21, 5 22, 2 and 3 respectively, belonging to fifty two genera of forty families. The most frequently used parts of ethnomedicinal plants, compiled with relevant literature were whole plant (26.42%), leaf and twig (16.98%), leaf and fruit (15.09%), fruit (13.21%), root and rhizome (9.43%), aerial parts, bark, root and flower (3.77% each) and followed by leaves and rhizome (1.89% each). The medicinal plants used to cure several ailments such as stomach ache, fever, cough, diarrhoea, dysentery, kidney problems, pain, wounds, cuts, insecticides, eye diseases, stop bleeding, abdomen pain, indigestion, antiseptic, healing foot cracks, mouthwash, blood diseases etc.

Keywords: Ethnomedicinal, Threatened, Traditional knowledge, plant part used

Introduction
The world’s most important means of treating diseases and combating infections has been the use of medicinal plant species. From ancient times, medicinal plants have been rich sources of efficient and safe medicines (Russell et al., 2006). Traditional herbal treatments have been a continuous source for the treatment of a variety of diseases (Kunwar et al., 2010) [22] not for the human beings but also for domestic animals. According to Manadhari (2002) [24], traditional herbal medicine has been used since ancient times in many parts of the world and particularly in India and in Uttarakhand. According to Farnsworth, 2004 near about 85% of the traditional herbal medicines used for healthcare are resultant of medicinal plants. According to Health Canada (2001), 70% of the population in Canada use traditional herbal medicine from plants. Also, 47% of the population in England use traditional herbal medicine derived from plants (Thomas et al., 2001) [39]. Moreover, in Latin America the WHO regional office for the Americas reports that 71% of the population in Chile and 40% of the population in Colombia use traditional herbal medicine (WHO, 2008) [42]. In India, the native people exploit a variety of herbs from the plants for effective treatment of various ailments (Verna et al., 2007) [41].

The rural communities living in remote areas of Uttarakhand, have their own way of living with in social and cultural moorings. Irrespective of their simplicity and complexity, these communities holds rich traditional knowledge on medicinal plants. However, this knowledge orally passes on from one generation to the next; thus, have vulnerability to wiped out (Kala, 2005) [31]. Such traditional knowledge is often an important part of their cultural identity. However, traditional knowledge on the use of medicinal plants and the techniques of making many herbal formulations have declined over the past few decades due to lack of awareness and spread of allopathic medicines (Kala, 1998). Regions with less accessibility and a
comparatively slow rate of development, such as mountainous areas like the Himalayas are excellent examples (Rao, 1996, Kala 2004) [31] of knowledge bank adopted by the local people regarding medicinal plants. With the passage of time the traditional knowledge system of primary health care of local communities in Uttarakhand is under great threat because of a number of factors including modernization, limitation of knowledge to older people and deforestation. The present study was conducted to understand the ethno – medicinal importance and conservation status of the plants in Uttarakhand. The study focused on the following: 1) the use and mode of preparation of medicinal plants by local inhabitants for various ailments, and 2) conservation status of medicinal plants in Uttarakhand and possible sustainable conservation measures.

Materials and methods

Details of study area

The present study was conducted in Joshimath block of Chamoli district of Garhwal Himalaya with elevation of 1360 to 2600 masl (Fig.1). The region has very rich biodiversity of plant and animal species with both subtropical and temperate forests.

Data collection

Ethnomedicinal inventory

Information on plants with ethnomedicinal uses was collected from the informants living in villages adjacent to the forest, after establishing oral prior informed consent in village meetings, about 10% of the inhabitants were interviewed about their dependence on the forest for various products especially medicinal uses. The informants were randomly selected and included men, women and children who regularly visited the forests. The interviews were collected in local dialect to avoid translation problem. The interviews were conducted through structured questionnaires to obtain information on medicinal plants, including local name, name of the disease for which the plant is used and mode of preparation, part of the plant used etc.

Result and discussion

A total of 53 plant species were recorded in the study area (Table). Among the medicinal plants, the recorded species of trees, shrubs, herbs, lichens and fungi are 21, 5 22, 2 and 3 respectively (figure 2), belonging to fifty two genera of forty families (Figure 2). Interns of number of medicinal plants Rosaceae was dominant family (7 species, 6 genera) of medicinal plants followed by Poaceae, Ericaceae, Lamiaceae and Ranunculaceae (Table 1). The most frequently used parts of ethnomedicinal plants, compiled with relevant literature were whole plant (26.42%), leaf and twig (16.98%), leaf and fruit (15.09%), fruit (13.21%), root and rhizome (9.43%), aerial parts, bark, root and flower (3.77% each) and followed blyeaves and rhizome (1.89% each) (figure 3, table 1). According to different reports (a, b, c, d and e) ten plant species encountered have been classified as rare, endangered, critically endangered, near threatened or vulnerable (Table 1).

Aconitum heterophyllum, Arnebia benthami, Angelica glauca, Betula utilis, Dactylorhiza fuchsii, Nardostachys jatamansi, Taxus wallichiana, Swertia chirayita, Picrorhiza Kurroao and Zanthoxylum armatum were recognized in threat category. The reported 53 medicinal plants used to cure several ailments such as stomach ache, fever, cough, diarrhoea, dysentery, kidney problems, pain, wounds, cuts, insecticides, eye diseases, stop bleeding, abdomen pain, indigestion, antiseptic, healing foot cracks, mouthwash, blood diseases etc. Root powder and extract of Aconitum heterophyllum, Picrorhiza Kurroao and leaf of Swertia chirayita are useful against fever, Rheum tibeticumum used for pain and hidden wounds, leaves of Thymus serpyllum, Origanum vulgare are used for cold and cough, Zanthoxylum armatum for dental decay and pyorrhea and gum bleeding, Berberis species were used for jaundice and Urtica dioica is beneficial for sprainand low blood level, Dactylorhiza and Ophiocordiceps are used as revitality (Table 1). The relationship between plants and people is connected through Ethnobotany (Khumbongmayum, 2005) [20], with rapid growth and developmental threat to the biodiversity is increasing at rapid speed, approximately 5000 species of animals and 25,00 plant species are currently listed as endangered, threatened, or at risk due to overexploitation (CITES, 2003) [3]. Uncontrolled developmental activities are causing a great loss to the biodiversity in the Indian Himalayan region, where medicinal plants in particular are declining at a very fast rate due to their over exploitation for trade (Samant et al., 2007) [33], moreover, the excessive anthropogenic activities are the main cause of decline and availability of medicinal plants in the region (Dhar et al., 2002, Dhyani and Kala, 2005) [9, 10]. There are many protected areas (PAs) across the Himalayan region with no single PA that has specifically established to ensure the conservation of medicinal plants.

However, uses of plant species can change over a short period without initially affecting knowledge but generating long-run changes in knowledge. Researchers could use the gap between knowledge of plant uses and actual uses to study erosion of indigenous knowledge of plant uses. The knowledge of traditional medicines is intact in the region and they use this knowledge mostly for the daily use. However, the concerned among the natives is that their ancestors were much skilled than them and used to keep all herbal medicines (jadi-buti) to cure contemporary health problems whereas, the present generation is being dependent on modern medicinal system. Albeit some dry herbal medicines are still available in their home and some are maintained in the home garden or kitchen where these herbs grow naturally. The traditional plant knowledge however is disappearing in many communities because of rapid socio-economic and cultural change. Therefore, the sustained use of this knowledge and its documentation is necessary.
Fig 1: Total number of species, genera families of plants having medical values

Fig 2: Percentage of plant parts use in preparing medicines for various ailments

Table 1: Plant species with their status and part used in different ailments

<table>
<thead>
<tr>
<th>Species name</th>
<th>Family</th>
<th>Vernacular name</th>
<th>Habitat</th>
<th>Part Used</th>
<th>Status</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aconitum heterophyllum Wall. ex Royle</td>
<td>Ranunculaceae</td>
<td>Atis, Indian Atees</td>
<td>H</td>
<td>Roots</td>
<td>R², Ce⁴, Vu⁴, E²</td>
<td>Roots powder and extract for curing fever and stomach ache [1]</td>
</tr>
<tr>
<td>Acorus calamus L.</td>
<td>Acoraceae</td>
<td>Bach, Sweet Flag</td>
<td>H</td>
<td>Rhizome</td>
<td>E⁴</td>
<td>Extract of rhizome often used in gastric troubles of infants [2]</td>
</tr>
<tr>
<td>Alnus nepalensis D.Don.</td>
<td>Betulaceae</td>
<td>Utees, Alder</td>
<td>T</td>
<td>Leaves</td>
<td>E⁶</td>
<td>Bark used in local medicine [2]</td>
</tr>
<tr>
<td>Angelica glauca Edgew.</td>
<td>Apiaceae</td>
<td>Choru</td>
<td>H</td>
<td>Root and rhizome</td>
<td>Ce⁴, Ce⁵</td>
<td>Seeds and roots used by locals to add flavor of edible, root powder with milk given in bronchitis as well as in constipation [2]</td>
</tr>
<tr>
<td>Arnebia benthami (Wall. ex. G.Don) Johns</td>
<td>Boraginaceae</td>
<td>H</td>
<td>Root</td>
<td>Extract of rhizome mixed with mustard oil is taken orally as syrup and also applied externally as hair tonic, antiseptic, throat problem and fever [1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berberis aristata Buch.-Ham. ex Lindl.</td>
<td>Berberidaceae</td>
<td>Kingora</td>
<td>S</td>
<td>Whole plant</td>
<td>E², NT</td>
<td>Bark yields dye, fruit edible, root extract in ophthalmia [3]</td>
</tr>
<tr>
<td>Betula utilis D. Don.</td>
<td>Betulaceae</td>
<td>Bhojpatra</td>
<td>T</td>
<td>Bark</td>
<td>E⁶</td>
<td>Extract/gum from stem/bark is applied externally during fever and body pain [3]</td>
</tr>
<tr>
<td>Celtis australis L.</td>
<td>Ulmaceae</td>
<td>Kharik</td>
<td>T</td>
<td>Leaf and twig</td>
<td></td>
<td>Bark paste applied on bones, pimples, joint pains [2]</td>
</tr>
<tr>
<td>Claudonia cartilaginea Mull. Arg.</td>
<td>Lecanoraceae</td>
<td>Jhula</td>
<td>L</td>
<td>Whole plant</td>
<td></td>
<td>Used as local medicine (present study)</td>
</tr>
<tr>
<td>Cynodon dactylon (L.) Persoon</td>
<td>Poaceae</td>
<td>Dubaghats</td>
<td>H</td>
<td>Whole plant</td>
<td></td>
<td>Whole plant paste is taken orally in dysentery, nose bleeding and anemia [1] Leaf extract is useful for control diabetes [10]</td>
</tr>
<tr>
<td>Dactylorhiza chagagirea (D. Don) Soo</td>
<td>Orchidaceae</td>
<td>Hattajari</td>
<td>H</td>
<td>Root and rhizome</td>
<td>Ce⁴, Ce⁵, Ce⁶</td>
<td>Tuber paste is taken orally to cure diarrhea, as an aphrodisiac and tonic [3]</td>
</tr>
<tr>
<td>Debregeasia salicifolia (D. Don) Rendle</td>
<td>Urticaceae</td>
<td>Syanru</td>
<td>T</td>
<td>Leaf and fruit</td>
<td></td>
<td>Plaster for Bone Fracture [7]</td>
</tr>
<tr>
<td>Dioscorea pentaphylla L.</td>
<td>Dioscoriaceae</td>
<td>Gajaria</td>
<td>H</td>
<td>Whole plant</td>
<td></td>
<td>Tubers are boiled and eaten [7]; Leaf paste mixed with mustard oil is rubbed on the effected part to treat rheumatism [3]</td>
</tr>
<tr>
<td>Dryopteris jutaposta Christ.</td>
<td>Dryopteridaceae</td>
<td>F</td>
<td>Leaf and twig</td>
<td></td>
<td></td>
<td>Plant used as an anthelmintic [3]</td>
</tr>
<tr>
<td>Echinocloacolina (L.) Link</td>
<td>Poaceae</td>
<td>Jharwa</td>
<td>H</td>
<td>Aerial parts</td>
<td></td>
<td>It cures ingestion [7]</td>
</tr>
<tr>
<td>Ficus pumila Forsk.</td>
<td>Moraceae</td>
<td>Bedu</td>
<td>T</td>
<td>Leaf and fruit</td>
<td></td>
<td>Fruits medicinal for digestive disorders, useful plant of agroforestry [2]</td>
</tr>
<tr>
<td>Flacourtia indica (Burm. f.) Merrill</td>
<td>Flacourtiaceae</td>
<td>Bilangra</td>
<td>T</td>
<td>Leaf and fruit</td>
<td></td>
<td>Decoction of fruits given in given hepatitis fever and diarrhea [2]</td>
</tr>
<tr>
<td>Geranium wallichianum D. Don</td>
<td>Geraniaceae</td>
<td>Laljeri/Ratanjot</td>
<td>H</td>
<td>Whole plant</td>
<td></td>
<td>Otorrhoeac ophthalmia [34], Dysentry &amp; cold [34]</td>
</tr>
<tr>
<td>Gerbera gossypina (Royle) G. Beauv.</td>
<td>Asteraceae</td>
<td>Kapingse</td>
<td>H</td>
<td>Whole plant</td>
<td></td>
<td>Cuts, wounds, plaster on bone fracture [21]</td>
</tr>
<tr>
<td>Grewia opposita J.R. Drummond ex</td>
<td>Tiliaceae</td>
<td>Bhumal</td>
<td>T</td>
<td>Leaf and twig</td>
<td></td>
<td>Fruits edible and medicinal use [21]</td>
</tr>
</tbody>
</table>
The results of the study indicate that medicinal plants are used frequently by local people in the region. Some of the plants are already under threat because of over exploitation; including conversion of forest into agricultural land etc. The majority of the population seems to be unaware of the threat
to the medicinal plants growing in the wild. Therefore efforts should be made to conserve and preserve the threatened species and also effort should be made to document the traditional knowledge.

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