CHAPTER 4
RESULTS AND DISCUSSIONS

Medicinal Herbs in Udham Singh Nagar

The medicinal properties of forest vegetation was analyzed in a submontane forest of Tarai and Bhawar of Kumaun adjacent to Kashipur, at (29º 14-43.6)–(29º 19-50.5) E longitude and (79º 03-22.6)–(79º 04-23.2) N latitude at an elevation of 253.4–265.5 meter above the sea level, within the districts of Nainital and UdhamSingh Nagar. 29 plants species belonging to 22 family, 26 genera, and 29 species were reported. Of these leaves in 19% cases, roots and whole plants in 16% cases, fruits and bark 13% cases are used. Based on life form 17 phanerophytes, 5 chamaephytes, 4 therophytes, 2 hemi cryptophytes and 1 therophyte were recorded by Bhaskar Joshi.

The use of plants in curing and healing is as old as man himself (Hedberg, 1987). All cultures have folk medicine traditions that include the use of plants and plant products. The World Health Organization (WHO) estimates that 4 billion people or 80 percent of the world’s population use herbal medicine for some aspect of primary health care.


There are about 1500 to 2000 species with known medicinal worth in India, which support an estimated 5000 indigenous drug manufactures, which make about 2000
preparations in different parts of the country. It is believed that 80% of the raw material requirement is met from the forest only (Chopra, 1994).

Herbal Market Scenario in India

The Ayurvedic, Unani, Siddha and Homeopathy system of medicine have been practiced in our country since time immemorial. However from the beginning of 19th century, the importance of Indian system of medicine gradually reduced due to introduction of modern allopathic system of medicine.

Table 2: Production of bulk drugs and formulations in India

<table>
<thead>
<tr>
<th>Year</th>
<th>Bulk drugs</th>
<th>Formulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-91</td>
<td>730.00</td>
<td>3840.00</td>
</tr>
<tr>
<td>1991-92</td>
<td>900.00</td>
<td>4800.00</td>
</tr>
<tr>
<td>1992-93</td>
<td>1150.00</td>
<td>6000.00</td>
</tr>
<tr>
<td>1993-94</td>
<td>1320.00</td>
<td>6900.00</td>
</tr>
<tr>
<td>1994-95</td>
<td>1518.00</td>
<td>7935.00</td>
</tr>
<tr>
<td>1995-96</td>
<td>1822.00</td>
<td>9125.00</td>
</tr>
<tr>
<td>1996-97</td>
<td>2186.00</td>
<td>10494.00</td>
</tr>
<tr>
<td>1997-98</td>
<td>2626.00</td>
<td>112068.00</td>
</tr>
<tr>
<td>1998-99</td>
<td>3053.00</td>
<td>14655.00</td>
</tr>
<tr>
<td>1999-2000</td>
<td>3603.00</td>
<td>16707.00</td>
</tr>
</tbody>
</table>

Source: Indian Drug manufacturers Association. (* as estimated)

One of the important steps required is to ensure better economic returns to collectors and cultivators of medicinal plants. These people, while very knowledgeable of the different species growing in their areas, are often not sufficiently aware of the markets. Usually traders or their representatives, visiting local areas are the only source of market information used by the local collectors. Availability and access of market information is a key to improve returns to producers of medicinal plants. The information is needed on demand, supply, end uses, distribution channels, product promotion, prices, marketing environment and institutions related to marketing. Even
simple interventions, such as, better method of collection, storage; grading and local level value addition can substantially improve returns to local people. Therefore, a system is required that can help local people as well as others involved in collection and cultivation of herbal plants, to access market information regularly, reliably, timely and at a lowest possible cost.

In spite of tremendous development in the field of synthetic drugs and antibiotics during the 20th century, plants still continue to be a major source of drugs in modern as well as traditional systems of medicine throughout the world. Globally, the estimated number of plant species used in curing therapy is about 52,885 and the proportion of medicinal plants to the total documented plant species in different countries varies from 4.4 percent to 20 percent (Schippmann et al., Hamilton, 2004). In India, of the 17000 species of higher plants 7500 are known for medicinal uses (Shiva, 1996) that are the highest proportion of plants known medicinally to any country of the world out of the existing flora of the respective country. Ayurveda, the oldest medical system in Indian sub-continent, has reported alone about 2000 medicinal plant species, followed by Siddha and the Charak Samhita recorded the uses of 340 herbal drugs (Prajapati et al., 2003).

From India this medical system spread into the neighbouring countries- Tibet, China, Sri Lanka, Myanmar, and also to Islamic countries further west, with time and circumstances it underwent and imbibed many changes and advanced. Medicinal and aromatic plants are found in forest areas throughout South Asia, from the plains to the high Himalayas, with the greatest concentration in the tropical and subtropical belts and arid region of Thar Desert. India recognizes more than 2,500 plant species as having medicinal value, Sri Lanka about 1,400, and Nepal around 700. Some of these, found at high altitudes in particularly stressful environments, grow very slowly and cannot live elsewhere. Others are more broadly distributed and adapt more easily to different ecological conditions.

The current level of International trade in medicinal plants is estimated to be in the order of US $62 billion per year and likely to grow up to US $ 5 trillion (Rs 5 lakh crore) by the year 2050 with an annual growth rate of 7-15%. The largest global markets for herb/medicinal and aromatic plants are China, France, Germany, Italy, Japan, Spain,
UK and the US. In India, the current trade in medicinal plants alone estimated at around Rs 550 crore. This market is growing steadily and annual export of herbal and medicinal products from India was expected to earn Rs 10,000 crore by the year 2010.

**Institutional Support**

To overcome problems of medicinal and aromatic plants (MAPs) conservation, institutional support has to be developed. Non-government organizations (NGOs), central and state Governments, research institutions and funding Agencies as the key players in this field, if coordinated well can play a vital role for Inventrioization, germplasm, and policy for regenerative cultivation. The institutions, which can take responsibility for both stakes and management of forest resources, are:

1. Forest Departments (GoI and SFD)
2. Local institutions
3. NGOs
4. Industries
5. International communities
6. International funding organizations.

The international conventions on bio-diversity conservation combating desertification, climate change and disposal of hazardous substances have drawn support of institutions like, IUCN, WWF, UNDP, FAO, SIDA, WB, IDRC, JICA, etc., to work together for conservation of medicinal herbs. A number of donor agencies are assisting forestry development in developing countries through social forestry, bio-diversity conservation, productivity and livelihood enhancement programs, natural resources management for watershed development, draught proofing etc. Forest based industries are facing acute shortage of raw material supply. The availability of wastelands outside forest areas could be a land resource for raising such plants in meeting industrial demand of raw materials supply. The mechanisms could be growing these plants directly by the industries or through individuals, SHGs, or other community based organizations.
(CBOs) or cooperatives under buy-back system. This will make units self-reliant or have assured supply besides providing necessary environmental and social security.

NGOs have the pivotal role in motivating and providing training facilities to villagers and farmers interested in growing medicinal plants on their field or around homestead for diversifying their existing livelihood on offering alternatives for their economic development. But the funding agencies should come forward to support their endeavor to start with and till the individuals / CBOs develop a sustainable financial base and arrangements of their own. Recently Central Government has established a National Medicinal Plants Board (NMPB) to create awareness to the people regarding importance of cultivating medicinal plants along with providing funds for this cause. It has also promoted setting up of State Medicinal Plant Boards (SMPBs) throughout the country to meet the challenge of increase of production and degradation of medicinal plants biodiversity. Such arrangements are doing well and some significant results are also coming out.

At the state level and block level, some co-operative societies based on medicinal plant cultivation and its trading are required to be established so that the problem of demand and supply of medicinal plants could be met. Cultivation on private and government lands will also decrease the pressure on the wild extraction resulting in conservation of MAPs in its natural habitat, along with the improvement of socio-economic status of growers. In this respect state or central government should provide training facilities in the villages to generate awareness of medicinal plants, their cultivation, harvesting, drying, storage and marketing. Research institutions and State Forest Departments have a larger role in sustainable development of medicinal plants. Efforts have to be made for preserving these plants in-situ by way of controlling over-exploitation, unscientific harvesting, protecting the plants in reserved forests and by enforcing legal channels so that endangered species do not become extinct. On the other hand efforts should also be made to undertake propagation and cultivation of such plants by raising planting materials in the forest nurseries while encouraging local people to undertake cultivation in their field with some initial financial support and assured marketing opportunities.
Besides this, the perception of tribal and local people should be updated to the renewed and enlarged with importance and H and MPs and motivate them for preservation and growth of such plants. Regional Research Laboratory, Jammu (RRL) has experience of last 60 years in the field of medicinal plants and they have been constantly updating their know-how. They have inventorised 75 species in the Himalayan region. RRL has undertaken ethno-botanical studies and can match international standards and has also been recognized as one of the four gene banks for ex-situ conservation. This laboratory can help in chemical analysis of the plant material. The Government of India has delineated areas of operation between the Department of Biotechnology and National Medicinal Plant Board related to sanctioning of the projects on medicinal plants. It is now as a policy that the Projects related to the research and development of herbs and medicinal plants have to be submitted to the department of Biotechnology and the Project related to cultivation, value addition, marketing and preparation of quality planting material and for capacity building has to be submitted to the National Medicinal Plants Board.

The region abounds in medicinal plants which can be used for herbal pharmaceutical industry. The cultivation of medicinal plants, particularly those found in high-altitude regions, can give a boost to the economy of the state. In the varying geographical and climatic conditions are different types of medicinal plants. Some of the medicinal plants growing up to 1000m are Bel, Chitrak, Kachnar, Pipali, Babul, Ashok, Amaltas, Sarpagandha, Bhringraj, Harar, Behera, Malu, Siris, Amla and Mossli. From 1000m to 3000m the medicinal plants grown are Banspa, Sugandhabala, Tejpat, Dalchini, Jhoola, Kuth, Timru, Painya, etc. Some of the medicinal plants grown above 3000 m are Atis, Mitha, Gugal, Jamboo, Mamira, Gandrayan, Bajradanti, Salammishri, etc. The sincere efforts should be made for the conservation and management of the herbs and medicinal plants.

The unorganized nature of the medicinal herbs/plants collection, extraction and utilization is one of the major challenges the sector faces now. Medicinal herbs and plants are inherent elements of the wild biodiversity but their populations are severely stressed on account of habitat loss, intensively destructive and unsustainable collection. One of the key features of medicinal plant collection, conservation and utilization is that happen largely in the unorganized sector and is not adequately reflected in national
resource accounting. Therefore there is a need of assessing the resource base and subsequently the conservation status of the medicinal plants. There is need of developing a long term strategy for threat assessment and monitoring the conservation status of medicinal plants. Again, threat assessment of medicinal group is important in every sense that this group includes all most all the plant life forms starting from herbs, climbers to trees. The Global strategy for plant Conservation (GSPC) which was adopted in 2002 all across the globe as a programme under the convention on Biological Diversity (CBD) has a target of assessing the conservation status of all known plant species (about 3,00,000 species) as far as possible, to guide conservation action. For achieving such a target, even partially, we need to embark on a rapid methodology for assessing the threat status of plant species especially the medicinal herbs and plants.

The Indian Himalayan region alone supports about 18,440 species of plants (Angiosperms: 8000 spp., Gymnosperm: 44 spp., Pteridophyte 600 spp., Bryophytes: 1736 spp., Lichens: 1159 spp., and Fungi: 6900 spp.) of which about 45% are having medicinal properties. According to Samant et al. 1748 species (vascular) are medicinal.

The maximum medicinal plants (1717 species) have been reported around the 1800 m elevation range. On the regional scale, the maximum species of medicinal plants have been reported from Uttaranchal, followed by Sikkim and North Bengal. The trans-Himalaya sustains about 337 species of medicinal plants, which is low as compared to other areas of the Himalaya due to the distinct geography and ecological marginal conditions (Kala and Mathur, 2002). Several plant species are endemic to the Himalayan region. Out of total known number of higher plants from India, approximately 46% are endemic to the Himalaya. Of the total medicinal plant species, sixty-two species of medicinal plants are endemic to the Himalaya and 208 extend their distribution to the adjacent areas, and are therefore classified as near endemic. Over 200 species of Himalayan medicinal plants are consumed raw, roasted, boiled, fried, cooked, or they are used in the form of oil, spices, jams or pickles. The indigenous communities use some medicinal plant species as a source of food, fodder, timber as well as various other ethnobotanical purposes. For example, apart from the use of Myrica esculenta and Terminalia bellirica as medicines, he fruits of these species are edible, the leaves are used for fodder and the wood is used for fuel. Approximately 81 species of Himalayan medicinal plants are known to be used for the extraction of oil. Of the total 675 species
of Himalayan wild edibles, 171 are used for the treatment of diseases. The crop plants diversity is also a source of traditional medicine. Apart from the human use, animal husbandry uses many plant species as its primary source of healthcare in northern India. The reliance on medicinal plants is also due to cultural preferences. Medicinal plants have strong acceptance in religious activities of north Indian native communities, who worship the plants in the form of various gods, goddesses and minor deities. *Origanum vulgare, Saussurea obvallata, Ocimum sanctum, Cedrus deodara, Cynodon dactylon, Aegle marmelos, Juniperus communis, Musa paradissica, Nardostachys grandiflora, Zanthoxylum armatum, Ficus benghalensis*, and *Ficus religiosa* are examples of the medicinal plants highly used for medicinal as well as a religious purposes by the Hindus in northern India. The Buddhist community in northern India regards *Terminalia chebula* as an important medicine as well as sacred fruit. It has been stated long ago that the therapeutic potency of medicinal plants is more effective and better suited to a person of a particular region or culture in which the plant is naturally growing. This idea has given a way to the development of a new drug for heart patients of specific ethnic groups in African countries. The importance of medicinal plants is not only restricted to the human use but animal husbandry also employs many plant species as a primary source of healthcare (Samant et al., 2004). According to ‘Kamarupi pharmacopoeia’, which is a unique traditional medical system of Assam, a total of 52 plant species with 18 recipes have been documented to cure 14 types of ailments in elephant (Borthakur et al., 2001).
Availability and Uses of Medicinal Plants

Table 3: Distribution of medicinal plants

<table>
<thead>
<tr>
<th>Country or region</th>
<th>Total no. of native species in flora</th>
<th>No. of medicinal plant species</th>
<th>Percent of medicinal plants</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>2,97,000</td>
<td>52,885</td>
<td>10</td>
<td>Schippmann et al. (2002)</td>
</tr>
<tr>
<td>India</td>
<td>17,000</td>
<td>7,500</td>
<td>44</td>
<td>Shiva (1996)</td>
</tr>
<tr>
<td>Indian Himalaya</td>
<td>8,000</td>
<td>1,748</td>
<td>22</td>
<td>Samant et al. (1998)</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>-</td>
<td>964</td>
<td>-</td>
<td>Kala</td>
</tr>
</tbody>
</table>

India is a veritable emporium of medicinal plants, because of varied physiography, soil and climatic conditions. The number of medicinal plants in India, both indigenous and exotic, has been variously put at between 3,000 to 3,500 species. Sixteen medicinal plants of exotic origin, introduced in India years back, are now considered as a part of India’s medicinal plants resources. Notable among these are, Senna, Psyllium, Belladonna, Cinchona, Eucalyptus, Ipecac, Digitalis and Mexican Dioscorea. The number of plants having confirmed therapeutic properties or yielding a useful chemical compound thus lays around 700 species. Out of these the plants providing largely or regularly used raw materials by Indian Drug and Pharmaceutical Industry are about 335, including those whose materials are imported from other countries. Some of which are liquorice, henbane, cassia bark, galangal, ephedra, long pepper and star anise are used in large quantities. India ranks foremost after South Korea in the supply of medicinal plants to the industrialized countries of the west, where demand for natural drug has been on the increase in recent years. Nearly three fourth of the drugs mentioned in the various pharmacopoeia are found in their natural state in India, since the climate and geographical conditions are congenial for commercial growing of indigenous and exotic medicinal plants.

Globally, about 85 percent of the traditional medicines used in primary healthcare are derived from plants. In today’s scenario there is lot of increasing pressure in health
care costs. Government is encouraging the use of indigenous system of traditional medicine rather than expensive synthetic drugs. It is reported that around 80% of the world’s population have still trust on traditional system of medicine. Herbal medicines include herbs, herbal preparations and finished herbal products that contain active principles of plant parts, or other plant materials, or combinations. Traditional use of herbal medicines has a long historical use of these medicines. Their use is well established and widely acknowledged to be safe and effective and is globally accepted.

The chemical composition present in them is a part of the physiological function of living flora and hence they are believed to have better compatibility with the human body. The herbal health care have therefore, been derived from rich traditions or ancient civilizations and scientific heritage which came to the present generations through primarily oral traditions. Medicinal plant parts should be authentic and free from pesticides, heavy materials, microbial or radioactive contamination, etc. The extract should be got checked for indicated biological activity on animals. The bioactive extract should be standardized on the basis of active constituents or major compounds.

The raw herbal material used for value added products must be used for:

* Isolation of active principles for formulation into drugs.
* Isolation of Intermediates for the production of semi – synthetic drugs.
* Preparation of standardized galenicals (extracts, powders, tinctures, etc).

India is a gold mine of herbal medicines with well-recorded and well practiced knowledge of traditional system of herbal medicines. But India has not been able to capitalize on this herbal wealth like China by promoting its use in the developed world despite their renewed interest in herbal medicines. This can be achieved by judicious product identification based on diseases found in the developed world for which no medicine or therapy is available. Therefore, the quality control measures of the raw materials, finished and processed products are very essential to compete in the international market.
Table 4: Some important wild plants used in traditional system of medicine by local people of U S Nagar

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Botanical names</th>
<th>Vernacular names</th>
<th>Disease/Ailments</th>
<th>Part used/Modes of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Achranthes aspera.</td>
<td>Laljeera, Ultukuru</td>
<td>Muscular cramps</td>
<td>Root decoction</td>
</tr>
<tr>
<td>2.</td>
<td>Aconitum ferox Wall. ex Su</td>
<td>Meetha Bish, Vatsnabh</td>
<td>Rheumatism, Neuralgia, Paralysis, dyspepsia, Phthisis, Rheumatic fever and perpeural fever</td>
<td>Paste of rhiwomes fried in Ghee (Clarified Butter) externally used powder of the purified rhizomes</td>
</tr>
<tr>
<td>3.</td>
<td>A. heterophyllum wall.ex Royle</td>
<td>Atees, Atibisha</td>
<td>Fever, Cough, Chills, Stoachache, Diarrhoea</td>
<td>Root powder mixed with honey and galls of Pistacia Ichinjuk (Kakarsingi)</td>
</tr>
<tr>
<td>4.</td>
<td>Actaea spicata L.</td>
<td>Mamira</td>
<td>Bronchial inflammation</td>
<td>Decoction of roots</td>
</tr>
<tr>
<td>5.</td>
<td>Allium consanguineum</td>
<td>Pharan</td>
<td>Indigestion, Faltulence</td>
<td>Leaves</td>
</tr>
<tr>
<td>6.</td>
<td>Anemone polyanthes</td>
<td>Ratanjot</td>
<td>Food Poisoning</td>
<td>Seed decoction</td>
</tr>
<tr>
<td>7.</td>
<td>Angelica glauca Edgew</td>
<td>Choru</td>
<td>Flatulence, Colic pain</td>
<td>Root stocks</td>
</tr>
<tr>
<td>8.</td>
<td>Arisaema wallichianum</td>
<td>Meen</td>
<td>Erysipelas &amp; Scabies</td>
<td>Root paste (externally)</td>
</tr>
<tr>
<td>9.</td>
<td>Arnebia benthamii</td>
<td>Laljari/balchari</td>
<td>Cuts and Wounds</td>
<td>Juice of fresh roots</td>
</tr>
<tr>
<td>10.</td>
<td>Asparagus filicinus</td>
<td>Jhiri</td>
<td>Sexual debility &amp; Uinogenital problem</td>
<td>Powder of dried tuberous roots</td>
</tr>
<tr>
<td>11.</td>
<td>Berginia stracheyi</td>
<td>Shilphari</td>
<td>Kidney stones, Sores, Swellings</td>
<td>Root decoction, Juice of leaves</td>
</tr>
<tr>
<td>12.</td>
<td>Boerhaavia diffusa</td>
<td>Punryaru</td>
<td>Jaundice</td>
<td>Decoction of roots</td>
</tr>
<tr>
<td>No.</td>
<td>Species Name</td>
<td>Common Name</td>
<td>Condition</td>
<td>Part Used</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------</td>
<td>-------------------</td>
<td>-----------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>13</td>
<td><em>Caltha palustris</em></td>
<td>Kushnya</td>
<td>Abscesses</td>
<td>Juice of leaves</td>
</tr>
<tr>
<td>14</td>
<td><em>Corydalis govaniana</em> Wall</td>
<td>Indrajata</td>
<td>Suppressed urination</td>
<td>Juice of entire plant</td>
</tr>
<tr>
<td>15</td>
<td><em>Cuscuta reflexa</em></td>
<td>Markriau/Amarbel</td>
<td>Sciatica</td>
<td>Decoction of plant</td>
</tr>
<tr>
<td>16</td>
<td><em>Dactylorhiza hatagirea</em></td>
<td>Salampanja</td>
<td>Cuts &amp; wounds</td>
<td>Powder of the root</td>
</tr>
<tr>
<td>17</td>
<td><em>Delphinium denudatum</em></td>
<td>Nirbishi</td>
<td>Confusions</td>
<td>Root paste</td>
</tr>
<tr>
<td>18</td>
<td><em>Dioscorea bulbifera</em> Linn</td>
<td>Genthi</td>
<td>Bronchial Cough</td>
<td>Tubers</td>
</tr>
<tr>
<td>19</td>
<td><em>D. deltoides</em> Wall</td>
<td>Tairu</td>
<td>Spermatonorrhoea</td>
<td>Rhizomes</td>
</tr>
<tr>
<td>20</td>
<td><em>Dolomaea macrocephala</em> DC.</td>
<td>Amlich, Chook</td>
<td>Sores</td>
<td>Extract of roots</td>
</tr>
<tr>
<td>21</td>
<td><em>Euphorbia hirta</em> L.</td>
<td>Dudhibari/Dudhi</td>
<td>Piles</td>
<td>Entire plant with curd</td>
</tr>
<tr>
<td>22</td>
<td><em>Eumaria officinalis</em></td>
<td>Pitlapapra</td>
<td>Fever</td>
<td>Juice of entire plant</td>
</tr>
<tr>
<td>23</td>
<td><em>Gentiana stipitata</em></td>
<td>Bumlya</td>
<td>Urinary infection</td>
<td>Root decoction</td>
</tr>
<tr>
<td>24</td>
<td><em>Geranium wallichiana</em></td>
<td>Neenai</td>
<td>Dysentery &amp; Diarrhoea</td>
<td>Root decoction</td>
</tr>
<tr>
<td>25</td>
<td><em>Gloriosa superba</em></td>
<td>Kalihari</td>
<td>Painful delivery</td>
<td>Root paste</td>
</tr>
<tr>
<td>26</td>
<td><em>Hedychium cuminatum</em></td>
<td>Kaporkachri</td>
<td>Dyspepsia, Piles</td>
<td>Purified root powder</td>
</tr>
<tr>
<td>27</td>
<td><em>Hippophae rhamnoides</em></td>
<td>Dhooplakkar</td>
<td>Cardiac trouble</td>
<td>Fruit juice</td>
</tr>
<tr>
<td>28</td>
<td><em>Megacarpa polyandra</em></td>
<td>Barmoola</td>
<td>Snake bite</td>
<td>Roots</td>
</tr>
<tr>
<td>29</td>
<td><em>Morina longifolia</em> Wall ex DC.</td>
<td>Bishkandara</td>
<td>Epilepsy, Hysteria</td>
<td>Root decoction</td>
</tr>
<tr>
<td>30</td>
<td><em>Nardostachys grandiflora</em> DC.</td>
<td>Jatamansi</td>
<td>Whooping cough, Bronchitis</td>
<td>Rhizomatous roots</td>
</tr>
<tr>
<td>31</td>
<td><em>Origanum vulgare</em></td>
<td>Bantulsi</td>
<td>Eczematous dermatitis</td>
<td>Extract of leaves</td>
</tr>
<tr>
<td></td>
<td>Species</td>
<td>Part Used</td>
<td>Conditions</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------</td>
<td>--------------------------------</td>
<td>-------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td><em>Paeonia emodi</em> Wall. Ex Royle</td>
<td>Chandraian</td>
<td>Diarrhea</td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td><em>Paris polyphylla</em> Sim.</td>
<td>Satwa</td>
<td>Severe coughing, fever and stomach disorders</td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td><em>Pocrorrhiza kurroa</em> Royle ex Beeth.</td>
<td>Kutki, Karwi</td>
<td>Piles, bone fractures</td>
<td></td>
</tr>
<tr>
<td>35.</td>
<td><em>Polygonatum verticillatum</em> All.</td>
<td>Deoringal, Mahameda, Mitha Dudia</td>
<td>Bone ache, Muscular pains, bruise</td>
<td></td>
</tr>
<tr>
<td>37.</td>
<td><em>Rhododendron anthropogon</em></td>
<td>Bhotiachai</td>
<td>Irregular mensuration</td>
<td></td>
</tr>
<tr>
<td>38.</td>
<td><em>Rubia manjith</em> Majitha</td>
<td>Asthma, Bronchitis</td>
<td>Root decoction</td>
<td></td>
</tr>
<tr>
<td>39.</td>
<td><em>Saussurea lappa</em> Kuth</td>
<td>Leucoderma</td>
<td>Root powder</td>
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<td>40.</td>
<td><em>S. obvallata</em> Braham Kamal</td>
<td>Metorrhagia</td>
<td>Root paste</td>
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<td>41.</td>
<td><em>S. simpsoniana</em> Yogeshwar</td>
<td></td>
<td>Decoction of entire plant</td>
<td></td>
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<tr>
<td>42.</td>
<td><em>Selinum wallichiana</em> DC.</td>
<td>Bhutkeshi</td>
<td>Hysteria, localized abdominal swelling</td>
<td></td>
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<tr>
<td>43.</td>
<td><em>Solanum nigrum</em> L.</td>
<td>Makoi</td>
<td>Spleen</td>
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<td>44.</td>
<td><em>Swertia chirayita</em> Chirayata</td>
<td></td>
<td>Fever</td>
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<td>45.</td>
<td><em>Tanacetum longifolium</em> Wall. ex DC.</td>
<td>Guggal</td>
<td>Worm infestation</td>
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<td>46.</td>
<td><em>Taraxicum</em> Dudhli</td>
<td>Gall stones</td>
<td>Powder of the roots</td>
<td></td>
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<tr>
<td>No.</td>
<td>Plant Name</td>
<td>Common Name</td>
<td>Condition</td>
<td>Preparation</td>
</tr>
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<td>-----</td>
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<tr>
<td>47</td>
<td><em>Thalictrum foliolosum</em> DC</td>
<td>Pilijari</td>
<td>Eye inflammation</td>
<td>Root decoction</td>
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<td>48</td>
<td><em>Thymus linearis</em></td>
<td>Van Ajwain</td>
<td>Asthmatic cough</td>
<td>Extract of leaves &amp; floral heads</td>
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<td>49</td>
<td><em>Typhonium diversifolium</em></td>
<td>Nakdoon</td>
<td>Anorexia &amp; as an energetic</td>
<td>Root powder mixed with honey</td>
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<td>50</td>
<td><em>Urocula indica</em> (Roxb.) Kunth</td>
<td>Vanpyaz</td>
<td>Dysmenorrhea</td>
<td>Juice of tubers</td>
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<td>51</td>
<td><em>Urtica dioica</em> L.</td>
<td>Kandali</td>
<td>Epilepsy &amp; Hysteria</td>
<td>Decoction of the entire plant</td>
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<td>52</td>
<td><em>Valeriana jatamansi</em></td>
<td>Samewa</td>
<td>Scrofula, Insomnia</td>
<td>Roots</td>
</tr>
<tr>
<td>53</td>
<td><em>Withania Somnunnmnnifera</em></td>
<td>Asgandh</td>
<td>Toothache, Tooth decay</td>
<td>Root powder</td>
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<tr>
<td>54</td>
<td><em>Zanthoxylum acanthopodium</em> DC</td>
<td>Timru/Tejphal</td>
<td></td>
<td>Stem bark</td>
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Medicinal herbs\plants used for primary healthcare by local people of Udham Singh Nagar, Uttarakhand, India

The present study highlights the traditional knowledge of local people of Udham Singh Nagar related with the use of plants as ethno-medicine. Extensive field trips were conducted in order to collect the ethnobotanical information. Questionnaire was made to gather data for local name, part used, disease treated, mode of administration and methods of preparation. Generally, they use 53 plant species belonging to 52 genera and 34 families used as herbal remedies by local people of Udham Singh Nagar.

India is rich in its tribal population from the ancient times with traditional knowledge system which deals with various important aspects and the health issues of the tribes. The folk people get their treatment with the help of local practitioners and own herbal preparations. The use of herbal medicines by the tribal communities is influenced by distinct socio-cultural practices, beliefs, support of traditional authority and services of traditional medicine men. These people have a close relationship with their ambient environment and basically depend on it for primary health care as they live in remote localities far away from modern facilities. Tribal people are the ecosystem people who live in close harmony with the nature and maintain a close relationship between man and environment and indigenous cultures are closely maintained by the tribal and other forest dwellers throughout the world. The documentation of the traditional knowledge on medicinal plants has been considered (Anonymous 1994; Cox 1994) to support the discoveries of new drugs for the benefit of mankind. More than 90% of raw matter required in the field of pharmaceutical is obtained from the wild resources (Kehimker 2000). Medicinal plants form a base for different healthcare systems among various societies. About 80% of traditional medicines used for primary healthcare are derived from plants (Farnsworth 1988). The traditional knowledge accumulated by them is unknown to most of the scientific communities. Concentrated efforts on such studies will reveal important information on the indigenous knowledge of vegetation, particularly in the field of medicine.

The medicinal properties of plant species have made an outstanding contribution to the origin and evaluation of many traditional herbal therapies. These traditional knowledge systems have started to disappear with the passage of time due to scarcity of
written documents and relatively low income in these traditions. Over the past few years, however, the medicinal plants have regained a wide recognition due to an escalating faith in the herbal medicine in view of its lesser side effects compared to allopathic medicine in addition the necessity of meeting the requirements of medicine for an increasing human population. In modern day treatment system, medicines start only after lot of tests is being done. This causes physical and mental problem and one has to also spend a lot of money. Traditional healers those who are skilled know all after checking the pulse rate and this saves money and time. In this healing system, a disease is treated not on the basis of symptoms but on the root causes. Thus, the fundamental cause of the disease is eradicated that provides relief. Thousand years of tradition has been preserved in our ayurvedic system. Thus we do not have only a healing system but our culture is preserved through Ayurveda. Through the realization of the continuous erosion of traditional knowledge of plants used for medicine in the past and the renewed interest at the present time, a need existed to review this valuable knowledge of medicinal plants with the purpose of developing medicinal plants sector across the different states in India.
Ayurveda is a complete healing system. It is not just a healing system but a way of life. We can’t separate it from our lives. In this system, a Vaidya not only examines the affected parts of the body but also the patients mind, soul and the imbalance of vata, human excreta and other elements. Every treatment which involves cure with the herbs enrich mind and body and it can also be used by healthy people. These herbs not only heal the patients but enrich the healthy persons by developing the immune system of the body.

We need to explore the potential in medicinal plants resources, to understand the challenges and opportunities with the medicinal plants sector, and also to suggest recommendations based upon the present state of knowledge for the establishment and smooth functioning of the medicinal plants sector along with improving the living
standards of the underprivileged communities. Our traditional system of healing is good for the economy of the country because of the availability of all medicines and nothing needs to be imported. On the contrary, there is a huge demand for these products abroad.

Udham Singh Nagar has a rich diversity of valuable medicinal plants, and attempts are being made at different levels for sustainable utilization of this resource in order to develop the medicinal plants sector in Udham Singh Nagar.

The present work is in District Udham Singh Nagar. The district is located in the Terai region, and is part of Kumaon Division. It is bounded on the north by Nainital District, on the northeast by Champawat District, on the east by Nepal, and on the South and west by Uttar Pradesh state. The study area is known for its rich biodiversity with varieties of useful plant species, many of which are of medicinally important and used in traditional system of medicine. The District is inhabited by two major tribal communities viz. Tharus and Bhoexas. The present investigation provides a detail idea of medicinal plants used by local people and tribals for treatment of different ailments.

The Tharu tribe is the largest primitive tribe of the Uttarakhand, who lives interiorly in the forest sustaining a close association with their ambient environment. The main occupation Tharu people is agriculture. Most of the work in agriculture fields is done by women folk. A local doctor or vaidya is found in each village known as ‘Bharara’ or ‘Bharrera’. They perform magical activities to derive away evil spirits, to treat diseases of children, where they some plant species. They have their own dialect, represent their own cultural descendancy. Although different workers have documented the uses of various medicinal plants from different parts of India (Gaur et al. 2010; Sharma et al. 2010; Sharma et al. 2011; Siddhiqui et al. 1995; Pandey and Pandey 2010; Rao 1981) but information on indigenous medicinal practices from this part is poorly documented, therefore, efforts were made to gather information on medicinal uses by the Tharu tribe which are presently under threat due to less interest of younger generation and modernization.

The intensive field survey and ground trotting needs much of time and is not affordable in the context of severity of threats to medicinal plants. A rapid process for
threat assessment needs to be taken up urgently else many of the important species may become extinct even before their identification and evaluation.

USES OF MEDICINAL HERB/PLANTS FROM UDHAM SINGH NAGAR

*Abrus precatorius* L. (Ghughachi)

Dog bite

Mix half of the seed with curd and take it twice a day for two or three days.

Aanjana Singh, Rudrapur, Udham Singh Nagar, Uttarakhand.

Baldness

Apply seeds paste on the scalp along with honey.

Meera Mandal, Sitarganj, Udham Singh Nagar, Uttarakhand.

Mouth ulcer

Apply the green leaf juice tropically.

Guljar Singh, Hazatnagar, Udham Singh Nagar, Uttarakhand.

Knee pain

Take seeds (6gm) orally with milk for 15 days.

Paridul Heera, Gadarpur, Udham Singh Nagar, Uttarakhand.

Backache

Mix powdered seeds of the plant along with powder of rhizome of *Acorus calamus*, roots of *Asparagus racemosus* Wild. and leaves of *Vitex nigundo* L., *Cannabis sativa* L., with honey. Make tablet and take one tablet twice a day for three to four weeks.

Sardar Sardara Singh, Dineshpur, U.S Nagar, Uttarakhand.
Other uses

Dried leaf and root powder is given orally in the case of eye complaint, decoction of young leaves is given orally for cough, leaf powder is given orally in case of urine problems and seed extract is used in case of sciatica.

It is one of the ingredients of tranquil medicine for relieving stress and anxiety. Ten patents have been found on the application of Abrus mainly as a natural sweetener and oral contraceptive.

*Achyranthes aspera* L. (*Latajeera*)

Poisonous bite

Take the fresh juice of the branch.

Sardar Sarwan Singh, Uttamnagar, Uttarakhand.

Toothache

Brush the teeth with freshly plucked roots.

Narendra Singh, Rudrapur, U.S Nagar.

Asthama

Grind the whole plant (50-100g) into a fine powder. Take 5g of this powder with water till the patient gets cured.

Manat Sodhi, Gadarpur, U.S Nagar.

Poisonous bites

Apply the root paste tropically and also take it orally.

Dr Raman Singh, U.S Nagar.
Abscess

Apply the root paste tropically.

Jagjit Singh, U.S Nagar

Itching

Take the powdered roots (5g) orally with water twice a day for seven days.


Fever

Grind roots (5g) with half black pepper into a fine powder. Take the powder orally.

Prakash Mandal, Dineshpur, U.S Nagar.

Hemorrhoids

Take a spoonful of dried root powder on an empty stomach till the ailment gets cured.

Vishwajeet biswas, U.S Nagar.

Headache

Make tablets (of about 5g) from the root paste. Take one tablet daily in the morning with water for three or four days.

Seema Rana, U.S Nagar.

Other uses

Dried aerial parts are taken orally in the case of diabetes; powder made from the dried plant is given orally to treat whooping cough; decoction of the plant is used as laxative; and the decoction of the plant is applied externally on boils and pimples.
Product ‘Cystone’ is made from this plant, which inhibits calculogenesis by reducing stone forming substances like oxalic acid, calcium hydroxyproline and prevents urinary tract infections. Many patients have been found on the medicinal applications of Achyranthes mainly for curing laryngopharyngitis, bronchial asthma.

*Aegle marmelos (L.) Corr. (Bel)*  

(Diabetes)

Take equal quantity of the leaves of *Aegle marmelos*, *Syzigium cumini* (L.), *Ocimun Sanctum* L., *Azadirachta indica* Juss. and *Ficus religiosa* L. Extract the juice and take one cup thrice a day. (Devender Kaur, U.S Nagar)

(Stomachache)

Grind the fresh roots along with one black pepper. Take two spoonfuls of the paste twice a day for two or three days.

Madhav Buxa, U.S Nagar.

(Diabetes)

Take the root juice (150ml) orally.

Prem Biswas, U.S Nagar.

(Intestinal worm)

Take the green leaf juice orally.

Jeewan bisht, U.S Nagar.

(Jaundice)

Take the leaf or fruit juice orally.

Babbu Singh, U.S Nagar.
Plate 1

Headache

Grind equal amounts of root of bel and leaves of Leucas aspera L. into a paste and apply.

Ramandeep Singh, U.S Nagar.

Nasal bleeding

Apply the leaf paste on the nose.

Simran kaur, U.S Nagar.

Other uses

Burnt fruit pulp is applied for rheumatic arthritis, 10g fruit pulp is given before sleep to overcome morning sickness, and fruit rind is applied externally on hair to kill headlice.

Bael juice is used in curing diarrhea, dysentery and GI disorders. It has digestive and carminative properties. Lukol’s tonic is made from this plant along with other plants. It improves uterine circulation, and its antimicrobial and astringent actions on the mucous membrane of the genital system also help to cure leucorrhoea. ‘Bilwa’ a product of Aegle is used as a medicine to cure a number of diseases. Many patients of diabetes and gastric ulcer have been cured by the use of Aegle. It is also used as herbal catalytic composition (US 6012417) for pollution control in automobiles.

**Bombax ceiba L. (Semal)**

Pimples

Make a paste of thorn with milk. Apply on the pimples for seven days.

Aditya Rana, U.S Nagar
Wound

Apply the fresh bark paste tropically.

Adiraj, Sitarganj, U.S. Nagar

Diarrhoea

Take a spoonful of leaf juice along with some sugar candy for four days.

Harbans Kaur, Rudrapur, U.K

Gynaecological disorder

Take the gum powder (5g) with water for four, five days.

Mira Das, Gadarpur, U.K

Constipation

Take the bark powder (3g), coriander powder and jaggery with water.

Deewan Joshi, U.K

Piles

Take the root paste (10g) with water for seven days

Bina Dasgupta, U.K

Itching in animals

Umesh Rathore, U.K

General health

Few flowers are soaked in water overnight. Filter and take the water the next morning to give a cooling effect to the body.

Ram Buxa, U.K
Other uses

Decoction of the bark is given orally to combat fever, decoction of the heart wood is given for controlling diabetes and bark juice is administered to reduce stomachache.

Product ‘Acne and Pimple Cream’ is prepared from Bombax along with other plants to treat pimples and skin eruptions.’Evecare’, a multi herb product made from this plant, has a regularizing influence on the menstrual cycle. Eight patents have been found on the medicinal applications of Bombax mainly for skincare and AIDS etc.

*Caltropis procera* (Maddar)

Itching and irritation

Warm the leaves smeared with mustard oil and make a bandage on the affected body part for two or three days

Sukhwant Kaur, Haldwani, Uttarakhand.

Inflammation

Apply the paste of fresh roots on the affected body parts.

Bijoy Tolia, U.K

Migraine

Heat the leaf and extract the juice. Put two or three drops in the nostril in the opposite side of the head having pain.

Inder Singh, Udham Singh Nagar, U.K

Stomachache

Smear mustard oil on a leaf and warm. Apply it over the abdomen for immediate relief. (Baba Kaliram, Udham Singh Nagar), U.K
Arthritis

Mix latex with turmeric powder, boil it with sesame oil and then apply the paste on the aching joint.

Sweta Singh, Pantnagar, Udham Singh Nagar, U.K

Skin diseases

Apply the bark paste on the infected part.

Kavita Heera, Udham Singh Nagar, U.K

Stomach disorder

Grind the leaves with turmeric and make tablets. Take on tablet orally till the ailment gets cured.

Ajit Das, Udham Singh Nagar, U.K

Knee pain

Take the leaf juice orally.

Brahamsankar, Udham Singh Nagar, U.K

Earache

Put the latex in the ear to cure the pain.

Madhurani Joshi, U.K

Other uses

Plant extract is used as a bronchodilator, flower buds of Calotropis along with black pepper seeds and salt, are crushed to make pills as the size of the small pea. Two pills are taken twice daily for three days to cure malaria, warm leaves smeared with oil are applied on the aching part to alleviate rheumatic pain. ‘Muscle and Joint Rub’ is a highly effective ointment for backaches, muscular sprains and joint pains. ‘Arkavaleha’ made from this plant is given to cure
irritation of the stomach, nausea, vomiting, diarrhea etc. Eight patents are found on the medicinal uses mainly for anti-tumor and antidotal activity and bronchial asthma.

**Tinospora cordifolia (Giloy)**

**Diabetes**

Soak handful of rice overnight in water. Take it the next morning after adding the powder of Tinospora leaves.

Deva Bharti, Bageshwar, Uttarakhand.

**Typhoid**

Take the decoction or powder of the stem orally

Mrinal Pandey, U.K

**Dengue**

Take the paste of leaves orally twice a day for six to seven days.

Daljeet Kaur, Rudrapur, U.K

**Asthma**

Take two spoonfuls of the leaf juice orally with honey for 40 to 42 days.

Gangaram, Udham Singh Nagar, U.K

**Diabetes**

Take leaf powder (small table spoon) daily to cure it. Always better to pluck the leaves from the climber which is climbed on neem tree.

Daljeet Kaur, Rudrapur, U.K
Rheumatism

Mix the plant (25g), dry ginger (5g) and sesame oil (5g) soak in water overnight. Take the filtered solution next morning.

Sarwan Singh Sandhu, U.K

Piles

Boil, dry and grind the whole plant (50g) into a fine paste. Make tablets and take one tablet thrice a day for three or four days.

Narendra Singh, U.K

Uses in Classical Codified Literature

Powdered roots are taken to cure mouth ulcer, powdered plant is administered orally with honey to get relief from stomach disorder, the stem is bitter and is used as anthelmintic, and decoction of the plant is given orally to cure diarrhea.

Tinospora is a well known medicinal plant and is used to cure a number of diseases in combination with other plants with brand names ‘Geriforte, Diabecon’ etc. More than a hundred patents are found on its medicinal applications mainly as an antiallergic and for cancer.

*Kalanchoe pinnata* (Pathar chatta)

Kidney stone

Take the leaf juice for 10 to 15 days.

Sukhidevi, Udham Sing Nagar.

Injury

Put warmed leaves on the affected body part.

Devashish negi, Udham Singh Nagar, U.K
Jaundice

Take the leaf juice along with black pepper daily.

Dr Ashish, Udham Singh Nagar, U.K

Kidney stones

Grind the leaves of the plant along with turmeric and extract the juice. Add some jaggery and take the preparation for ten days.

Nirmal Pant, U.K

Eye pain

Put two drops of the leaf juice in the eyes.

Sukhwant Kaur, U.K

Stomach disorder

Take two spoonfuls of the leaf juice orally along with some sugar.

Kamlesh Tripathi, U.K

Cuts and wounds

Apply the paste of the leaves tropically.

Daljeet Kaur, U.K

Pain

Apply the leaf paste tropically.

Daljeet Kaur, U.K

Other uses

Plant paste is applied on the head to get rid of headache. Leaf paste is often used externally to cure cuts and wounds by the people. Fresh sap of the plant is used to cure eye problems. Product ‘Regenerating Day Cream’ is a multiherbal medicine...
which enhances skin tone and elasticity and also help in diminishing wrinkles of skin. Five patents were found on the applications of Pathar chatta as antiobesity medication.

**Centella asiatica (L.) Urban (Brahmi)**

**Impotency**

Take the leaf paste of Centella and Tinospora cordifolia (L.) daily in the morning.

Umesh Rathore, U.K

**Memory enhancer**

Take the leaf juice orally.

Shayama Devi, U.K

**Skin diseases**

Apply the leaf paste orally over the affected part.

Savitri, U.K

**Malaria**

Take the decoction of the plant along with tulsi and giloy thrice a day.

Daljeet, U.K

**Toothache**

Make a paste of brahmi leaves, garlic cloves and banana roots. Apply tropically and leave for one hour.

Aditya Kohli, U.K
Sinusitis

Grind leaves (10g) along with one black pepper and extract the juice. Put three drops into the nostrils. Continue the treatment for three days.

Ganesh bajpai, U.K

Dysentery

Grind leaves (10g) of Brahmi and guava to make a paste. Take this paste twice a day for ten days. In case of chronic dysentery continue the treatment for three months.

Gurnam Singh, U.K

Make a paste of leaves and take it orally.

Dilip Bora, U.K

Herbal Tea for immunity

Add some leaves of brahmi while preparing tea. It will help to enhance the immunity.

Jasmit singh, U.K

Insomnia

Include whole plant paste in daily diet.

Haripad, U.K

Other uses of Brahmi

Fresh juice of the aerial part is used as a brain tonic. Powder of the aerial parts is used to control high blood pressure. Herbal Tea is indicated as a health drink. ‘Mentat’ improves mental functions, mental quotients, memory span, and concentration ability and stress threshold. More than three hundred patents are found on its medicinal applications mainly as an anti-depressant.
**Ficus racemosa L. (Gular)**

Nose bleeding

Take the crushed fruits with an equal quantity of jaggery.

Deepak Balutia, Nainital, Uttarakhand

Mouth sores

Apply the latex on the sores

Arti Balutia, Nainital, Uttarakhand

Jaundice

Mix two drops of the latex in a glass of water. Take it in the morning on an empty stomach for seven days.

Srman pandey, U.K

Gynecological disorder

Take the leaf juice of gular orally.

Dr Satyaprakash, U.K

Poisonous bite

Massage crushed tender leaves over the affected part.

Dipti Pandey, U.K

Other uses

Dried bark is given orally to cure diarrhea, diabetes should take the decoction of roots, and dried root powder is administered orally to combat fever.

Product ‘Trcawin’ is prepared from this plant in combination with other herbs for the treatment of specific and non-specific leucohoaea. ‘Diabet Guard Cpsules’ are used to cure diabetes. It is also used to cure stomach ulcers.
**Solanum nigrum L. (Makoi)**

**Inflammation**

Make a curry of Solanum and Cuscuta reflexa Roxb. Take it for three or four days.

Choti Devi, Udham Singh Nagar, Uttarakhand

**Malaria**

Take the decoction of the plant along with holy basil thrice a day.

Daljeet Kaur, Rudrapur, Uttarakhand

**Nasal Bleeding**

Boil dry fruit (25g) in mustard oil (100gm) and filter. Apply the filtrate on the forehead.

Sahil Sadana, U.K

**Mouth ulcer**

Chew the leaves

Sriram Bhatt, U.K

**Cough**

Take the root juice orally

Fry the leaves of Makoi (200g) in mustard oil (20ml) and take it orally with a little salt.

Dr. Savesh, U.K

**Jaundice**

Take the root juice orally
Suman Kashyap, Rudrapur, U.K

Stomachache

Take the fried leaves of Solanum, neem and Vitex negundo L. orally twice a day.

Meera Bajpai, U.K

Other uses

Powdered fruit is given orally to reduce the fever, juice extracted from the whole plant is applied externally on the burnt part, fruits are ground and taken orally to cure diarrhea.

‘Herbolax’ made from Solanum along with some other plants is used as gentle laxative in case of constipation and for electrolyte balance. Ninety patents are found on its medicinal uses mainly on hepatitis.

Carica papaya L. (Papita)

Kidney stone

Take the fresh root paste for 21 days

Umesh Rathore, U.K

Take the root paste with water for 21 days.

Kalawati Devi, Udham Singh Nagar, Uttarakhand.

Jaundice

Eat the curry of tender fruit

Dev Bisht, U.K

Kidney stone

Take the root juice orally
Simar Pangti, U.K

Cuts and wounds

Apply the leaf paste tropically

Jainarayan singh, U.K

Jaundice

Take the root decoction thrice a day along with some other herbs.

Dev Bisht, U.K

Toothache

Keep cotton dipped in the latex of the stem on the aching tooth.

Mangaram, Udham Singh Nagar.

Intestinal worms

Take fresh latex mixed with honey orally.

Kusum Dasgupta, U.K

Ring worm

Apply the milk latex on the affected area.

Kusum Dasgupta, U.K

Kidney stone

Take the root juice orally

Sreratha Joshi, U.K

Other uses of papaya

Decoction of the flower is used as a cardio-tonic, bark powder is applied externally on the wounds, decoction of the bark is given orally to get rid of
intestinal worms, beverage of the fruit is taken orally to cure diarrhea. Natural moisturizers and creams are prepared from Carica in combination with other plants. Thirty patents are found on its medicinal uses as an anti-allergic and for prevention of cancer.

**Ziziphus mauritiana Lamk. (Bor)**

**Indigestion**

Mix the fruit pulp of Ziziphus with one year old vinegar and add some black salt to it. Take the formulation for fifteen days on an empty stomach.

Jivan Nath, Udham Singh Nagar, Uttarakhand.

**Hair Care**

Boil the fresh leaves (100-150gm) in one liter of water. Wash the hair with cooled decoction.

Anantanand Singh, U.K

**Acne**

Apply the leaf paste tropically

Ajay Jena, U.K

**Indigestion**

Take one spoonful of the root paste orally.

Madhurima Bisht, U.K

**Other uses**

Pounded leaves are applied on boils, powdered leaves are taken to reduce blood sugar, decoction of the plant is administered orally as a diuretic, and powder of dried fruit is given orally with water to cure diarrhea. ‘Dhanwantharam oil’ is
prepared from Ziziphus along with other plants used for rejuvenating body and skin care. More than ten patents have been found on its medicinal applications mainly for treating cancer and tumorous growth.

*Aloe vera* (Aloe) (Plate 2)

*Protecting Human immune system*: The whole leaf extract galvanizes the cells of the immune system. The phagocytes increase their scavenging activities, thus cleaning the body and kicking off a whole cascade of protective actions which strengthen immunity.

*Improves digestive system*: Aloe juice helps in digestive disorders. Constipation, diarrhea, indigestion, irritable bowel syndrome etc are cured by the flushing action. The deposits of toxins and unwanted substances in our diet which keep accumulating in intestines prevent the absorption of essential nutrients causing nutritional deficiency, lethargy, constipation, lower back ache. Aloe juice helps flush out these residues boosting the digestion and giving a greater feeling of well-being.

*In arthritis*: Being a stimulant to the immune system, a powerful anti-inflammatory, an analgesic and able to speed up cell growth, it repairs arthritis damaged tissue. While conventional allopathic treatment only relieves pain, Aloe helps in repair process by regenerating cells and detoxifying the affected area.

*In stress*: Aloe Vera juice is just the thing to get our machinery smoothly effectively going.

*In cancer*: Aloe juice enables the body to heal itself from cancer and the damage done by radio and chemotherapy which destroy healthy immune cells crucial to the recovery.
Plate 2

Different stages of *Aloe vera* (L.) Burm. f.
In diabetes: It lowers glucose and tri-glyceride levels in diabetic patients. Effects can be seen from the second week of the treatment.

In hepatitis: Extract of aloe juice has been shown to have beneficial effects on liver and alleviate symptoms considerably in chronic hepatitis patients.

In heart diseases: Addition of isabgol and Aloe Vera juice to the diet of patients of angina pectoris, results in marked reduction of serum cholesterol and tri-glycerides and increase in level of HDL.

In AIDS: A daily dose of min 1200mg of active ingredients of aloe showed substantial improvement in AIDS symptoms. Says Dr. Pulse, Aloe is to an AIDS patient as insulin to a diabetic.

In piles: Aloe has been found useful in piles, mixed in small quantities with sulphur. It is applied by natives externally in the form of leap-paste in pleurisy. A sweetmeat, halwa, is prepared from the pulp of the leaves and given in case of piles.

In wound and skin diseases: Aloe gel is excellent for easing first degree burns, relieves inflammation and accelerated healing. Aloe gel has anti-fungal, anti-bacterial and anti-viral effects and helps heal minor wounds. It lessens effects of shingles, reduces symptoms of psoriasis and eases heartburns and ulcers.

Jaundice

A few drops of aloe juice are installed in the nostrils to control jaundice.

Liver disorders

Aloe juice with turmeric powder should be taken twice a day.

Difficult urination

Continuous diluted aloe juice should be taken time to time to alleviate this condition.

In wounds

Boil aloe leaves and take the fleshy part from inside of the leaves to use as a poultice over wounds.
As a cosmetic

Aloe is one of the best known moisturizers and used in creams and shampoos.

List of 29 plants along with family, common name, vegetation type, and plant parts used, active constituents, life form and medicinal uses found in Udham Singh Nagar are described below:

**Acacia catechu** *Willd.*

Family: Mimosaceae; Common Name: Kattha, Khair; Vegetation Type: Tree; Plant parts: Wood; Constituents: Tannins; Life form: Phanerophyte.

Use: Diarrhoea, cleaning mouth and gums.

**Aegle marmelos** *(L.) Correa*

Family: Rutaceae; Common Name: Bel; Vegetation Type: Tree; Plant parts: Fruits; Constituents: Carbohydrates, Tannins; Life form: Phanerophyte.

Use: Diarrhoea, dysentery, digestive, appetizer and tonic

**Asperagus racemosus** *Willd.*

Family: Liliaceae; Common Name: Satavar; Vegetation Type: Herb; Plant parts: Roots; Constituents: Saponins; Life form: Therophyte.

Use: Antioxytocis and galactagogue activity.
**Bauhinia malabarica Roxb.**

Family: Caesalpiniaceae; Common Name: Kachnar; Vegetation Type: Tree; Plant parts: Leaves and Bark; Constituents: Tannins; Life form: Phanerophyte.

Use: Vermifuge and antispasmodic.

**Biophytum sensitivum Zucc.**

Family: Oxalidaceae; Common Name: Lajalu; Vegetation Type: Herb; Plant parts: Roots and Leaves; Life form: Therophyte.

Use: Diuretic, antipyretic and swelling of body.

**Boerhaavia diffusa L.**

Family: Nyctaginaceae; Common Name: Punarnava; Vegetation Type: Herb; Plant parts: whole plant; Constituents: Alkaloids; Life form: Hemicryptophyte.

Use: Liver tonic, diuretic and anti-inflammatory.

**Bombax ceiba L.**

Family: Malvaceae; Common Name: Semul; Vegetation Type: Tree; Plant parts: Flower, Gum and Root; Constituents: Tannin, Carbohydrates and Fatty Acids; Life form: Phanerophyte.

Use: Gout and urinary tract infection.
**Cannabis sativa L.**

Family: Urticaceae; Common Name: Bhang; Vegetation Type: Shrub; Plant parts: Flowering tops; Constituents: Resins, Carbohydrate and Fatty Acids; Life form: Chamaephyte.

Use: Sedative and antiemetic.

**Cassia fistula L.**

Family: Caesalpiniaceae; Common Name: Amaltas; Vegetation Type: Tree; Plant parts: Leaves and Pods; Constituents: Glycosides; Life form: Phanerophyte.

Use: Laxative and skin disorders.

**Catharanthus roseus (L.) G.Don**

Family: Apocynaceae; Common Name: Sadabahar; Vegetation Type: Shrub; Plant parts: Whole Plant; Constituents: Alkaloids; Life form: Chamaephyte.

Use: Antineoplastic agent.

**Centella asiatica (L.) Urb.**

Family: Apiaceae; Common Name: Brahmi; Vegetation Type: Herb; Plant parts: Whole Plant; Constituents: Triterpenoid Saponins and Glycosides; Life form: Hemicryptophyte.

Use: Brain tonic, antianxiety and antistress.
**Cuscuta reflexa** Roxb.

Family: Convolvulaceae; Common Name: Amar Bael; Vegetation Type: Climber; Plant parts: Whole Plant; Constituents: Cuscutalin and Cuscutin; Life form: Phanerophyte.

Use: Vermifuge and heart tonic.

**Datura stromonium** L.

Family: Solanaceae; Common Name: Dhattura; Vegetation Type: Herb; Plant parts: Leaves and Flowering tops; Constituents: Alkaloids; Life form: Chamaephyte.

Use: Spasmolytic. It is used in cases of vomiting and motion sickness.

**Eucalyptus hybrid** L. Herit.

Family: Myrtaceae; Common Name: Safeda; Vegetation Type: Tree; Plant parts: Leaves; Constituents: Volatile oils; Life form: Phanerophyte.

Use: Antiseptic, diaphoretic and expectorant.

**Ficus racemosa** L.

Family: Moraceae; Common Name: Gular; Vegetation Type: Tree; Plant parts: Fruits; Life form: Phanerophyte.

Use: Blood disorders, piles and gonorrhoea.
**Ficus religiosa L.**

Family: Myrtaceae; Common Name: Pipal; Vegetation Type: Tree; Plant parts: Bark; Constituents: Tannins; Life form: Phanerophyte.

Use: Laxative and astringent.

**Holarrhena antidysenterica Wall.**

Family: Apocynaceae; Common Name: Inderjhon; Vegetation Type: Tree; Plant parts: Bark; Constituents: Alkaloids; Life form: Phanerophyte.

Use: Antidysenteric and febrifuge.

**Holoptelea integrifolia Planch.**

Family: Ulmaceae; Common Name: Kanju; Vegetation Type: Tree; Plant parts: Leaves; Constituents: Tannins; Life form: Phanerophyte.

Use: Pyorrhoea and cleaning mouth and gums.

**Justicia adhatoda Nees**

Family: Acanthaceae; Common Name: Vasaka; Vegetation Type: Shrub; Plant parts: Leaves; Constituents: Alkaloids; Life form: Chamaephyte.

Use: Expectorant, bronchitis and cough.

**Murraya koenigii Spreng.**

Family: Rutaceae; Common Name: Karipatta; Vegetation Type: Shrub; Plant parts: Whole Plant; Constituents: Volatile oils; Life form: Phanerophyte.
Use: Dysentery and antidote in poisoning.

**Piper nepalense Miq. (E.)**

Family: Piperaceae; Common Name: Pipali; Vegetation Type: Herb; Plant parts: Fruits; Constituents: Volatile oils; Life form: Therophyte.

Use: Cough and bronchitis.

**Plumbago zeylanica L.**

Family: Plumbaginaceae; Common Name: Chitrak; Vegetation Type: Shrub; Plant parts: Root and Bark; Constituents: Plumbagin; Life form: Chamaephyte.

Use: Anoxia, to cure hydrocoel and also used for skin diseases.

**Rauwolfia serpentina Benth.**

Family: Apocynaceae; Common Name: Sarpgandha; Vegetation Type: Herb; Plant parts: Roots; Constituents: Alkaloids; Life form: Therophyte.

Use: Malaria.

**Ricinus communis L.**

Family: Euphorbiaceae; Common Name: Arandi; Vegetation Type: Tree; Plant parts: Seeds; Constituents: Fixed Oils; Life form: Phanerophyte.

Use: Laxative.
**Terminalia arjuna W & A.**

Family: Combretaceae; Common Name: Arjun; Vegetation Type: Tree; Plant parts: Bark; Constituents: Tannins; Life form: Phanerophyte.

Use: Cardiac disease, diuretic and astringent.

**Terminalia bellerica Roxb.**

Family: Combretaceae; Common Name: Bahera; Vegetation Type: Tree; Plant parts: Fruits; Constituents: Tannins; Life form: Phanerophyte.

Use: Diarrhoea and dysentery.

**Terminalia chebula Retz.**

Family: Combretaceae; Common Name: Harar; Vegetation Type: Tree; Plant parts: Fruits; Constituents: Tannins; Life form: Phanerophyte.

Use: Diarrhoea and dysentery.

**Vitex negundo L.**

Family: Verbenaceae; Common Name: Simalu; Vegetation Type: Shrub; Plant parts: Whole Plant; Constituents: Alkaloids; Life form: Phanerophyte.

Use: Rheumatic arthritis, mental disorder and backache.

**Zingiber capitatum Roxb.**

Family: Zingiberaceae; Common Name: Ban Haldi; Vegetation Type: Herb; Plant parts: Roots and Rhizome; Constituents: Alkaloids; Life form: Geophyte.
Use: Antiseptic and used in skin care.

*Ocimum sanctum* L.  
(Plate 3)

Family: Lamiaceae; Common Name: Tulsi, Vegetation: Herb, Plant parts: leaves, stem.

Use: Since ancient times Tulsi plant is regarded as very efficacious in giving the strength to the body and has been used in traditional home remedies to cure cold and cough, hoarseness, eye troubles, sinus congestion and pneumonia, respiratory disorders like bronchitis and asthma, blood pressure, heart ailments, high blood sugar levels and cholesterol, epilepsy, hysteria, insomnia, paralysis etc.

*Aegle marmelos* (L.) Correa

Family: Rutaceae, Common Name: Bael, Type: Tree, Constituents: Tannic acid, marmalosin.

Uses: It cures kapha and vatta, is an effective purgative, enhances digestion functions and promotes digestion. It binds blood and cures cough. It controls the sugar levels in urine. It is nutritious though bitter in taste and cures diarrhea, bleeding diarrhea, dysentery, diabetes, leucorrhoea, excessive menstrual flow, and bleeding piles.

*Emlica officinalis* Gaertn.

Family: Euphorbiaceae, Common name: Anwala, Constituents: Tannic acid, gallic acid.

Uses: It is anti-pyretic, anti-dermatoses, healthy for heart as it is a blood purifier. It is beneficial for eyes and digestive system and also cures difficult and incurable fever.
Plate 3

Different stages of *Ocimum sanctum* Linn
MEDICINAL HERBS/PLANTS SUITABLE FOR PLANTING IN STUDY AREA OF UDHAM SINGH NAGAR

1. *Coleus barbatus* Benth. (Plate 4)

Vernacular name: Pathar chur

Propagation: With seed and stem cutting

Germination of seed: 20-25 days

Plantation material /nali: 50 gm seed per row

Sowing: June

Distance between plants: 45 cm x 20 cm

Plant number per row: 2200 plants

Harvest duration: 6 months

Harvesting: December-January

Post Harvest Management: Root dried in sun light, projection from moisture, stored in jute bags

Average yield/row: 44 kg, dried root 20 gm/plant

Market price: Rs. 35/- to 50/- per kg dried root

Cost of cultivation: Rs. 500/- per row

Gross return: Rs. 1540/- per row

Net return: Rs. 1040/- per row
Plate 4

Different stages of *Coleus barbatus* Benth.
2. *Rosmarinus officinalis* Linn.  (Plate 5)

Vernacular name: Rosemary

Propagation: Seeds stem and twigs cutting stem cutting planted in February-March

Germination of seed: 30-40 days

Sowing: July

Distance between plants: 50 cm x 60 cm

Plant number per row: 530 plants

Harvest duration: 10 years

Harvesting: February, May, August and November

Post Harvest Management: Tender stem / Twigs distillation

Average yield/row: 200 kg green leaves or 1 kg oil

Market price: Rs. 1200/- per kg oil

Cost of cultivation: Rs. 800/- per row 1st year after that Rs. 300/- per row per year

Gross return: Rs. 12000/- per row per 10 years

Net return: Rs. 8500/- per row per 10 years

Average profit: Rs. 850/- per row per years
Different stages of *Rosmarinus officinalis* Linn.
3. *Pelargonium graveolens* (L.) Herit. (Plate 6)

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vernacular name:</td>
<td>Geranium</td>
</tr>
<tr>
<td>Propagation:</td>
<td>Upper parts of twigs</td>
</tr>
<tr>
<td>Germination (rooting):</td>
<td>10-20 days</td>
</tr>
<tr>
<td>Plantation time:</td>
<td>October-November</td>
</tr>
<tr>
<td>Distance between plants:</td>
<td>45 cm x 45 cm</td>
</tr>
<tr>
<td>Plant number per row:</td>
<td>975 plants</td>
</tr>
<tr>
<td>Harvest duration:</td>
<td>3-4 years</td>
</tr>
<tr>
<td>Harvesting:</td>
<td>3 cuttings per year</td>
</tr>
<tr>
<td>Post Harvest Management:</td>
<td>Stem cut in small pieces for distillation</td>
</tr>
<tr>
<td>Average yield/row:</td>
<td>500 gm oil per 500 kg stem pieces</td>
</tr>
<tr>
<td>Market price:</td>
<td>Rs. 3200/- per kg</td>
</tr>
<tr>
<td>Cost of cultivation:</td>
<td>Rs. 1000/- per Nali</td>
</tr>
<tr>
<td>Gross return:</td>
<td>Rs. 1600/- per Nali</td>
</tr>
<tr>
<td>Net return:</td>
<td>Rs. 600/- per Nali per year</td>
</tr>
</tbody>
</table>
Plate 6

Different stages of *Pelargonium graveolens* (L.) Herit.
<table>
<thead>
<tr>
<th><strong>Vernacular name:</strong></th>
<th>Sarpgandha</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soil:</strong></td>
<td>Sandy clay to clay soil</td>
</tr>
<tr>
<td><strong>Climate:</strong></td>
<td>Hot and moist subtropical</td>
</tr>
<tr>
<td><strong>Altitude:</strong></td>
<td>350-1200 m</td>
</tr>
<tr>
<td><strong>Propagation:</strong></td>
<td>Seed and root cutting</td>
</tr>
<tr>
<td><strong>Germination (rooting):</strong></td>
<td>20-30 days</td>
</tr>
<tr>
<td><strong>Sowing time:</strong></td>
<td>June, July-August</td>
</tr>
<tr>
<td><strong>Distance between plants:</strong></td>
<td>30 cm x 30 cm</td>
</tr>
<tr>
<td><strong>Plant number per row:</strong></td>
<td>2200 plants</td>
</tr>
<tr>
<td><strong>Harvest duration:</strong></td>
<td>18 months</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td>December-January</td>
</tr>
<tr>
<td><strong>Post Harvest Management:</strong></td>
<td>Roots separated and washed carefully so that the outer layer of root should not be damaged drying in semi shade and stored in gunny bags.</td>
</tr>
<tr>
<td><strong>Average yield/nali:</strong></td>
<td>55 kg dry roots (25 gm per plant)</td>
</tr>
<tr>
<td><strong>Market price:</strong></td>
<td>Rs. 80/- to 100/- per kg (dry roots)</td>
</tr>
<tr>
<td><strong>Cost of cultivation:</strong></td>
<td>Rs. 2000/- per Nali</td>
</tr>
<tr>
<td><strong>Gross return:</strong></td>
<td>Rs. 4400/- per Nali</td>
</tr>
<tr>
<td><strong>Net return:</strong></td>
<td>Rs. 2400/- per Nali</td>
</tr>
<tr>
<td><strong>Average profit:</strong></td>
<td>Rs. 1200/- per Nali per year</td>
</tr>
</tbody>
</table>
Plate 7

Different stages of *Rauvolfia serpentina* Benth. Ex Kurz.
### 5. *Gloriosa superba* L.  
(Plate 8)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vernacular name</td>
<td>Kali hari</td>
</tr>
<tr>
<td>Soil</td>
<td>Sandy clay with well water drainage texture</td>
</tr>
<tr>
<td>Climate</td>
<td>Hot and moist subtropical</td>
</tr>
<tr>
<td>Altitude</td>
<td>350-1500 m</td>
</tr>
<tr>
<td>Propagation</td>
<td>Rhizome and seed</td>
</tr>
<tr>
<td>Germination (rooting)</td>
<td>25-30 days</td>
</tr>
<tr>
<td>Plants or seed /nali</td>
<td>75 gm seed or 50 kg Rhizome</td>
</tr>
<tr>
<td>Sowing time</td>
<td>May-June</td>
</tr>
<tr>
<td>Rhizome</td>
<td>July</td>
</tr>
<tr>
<td>Distance between plants</td>
<td>60 cm x 30 cm</td>
</tr>
<tr>
<td>Plant number per row</td>
<td>1100 plants</td>
</tr>
<tr>
<td>Harvest duration</td>
<td>5 years</td>
</tr>
<tr>
<td>Harvesting</td>
<td>October- November</td>
</tr>
<tr>
<td>Post Harvest Management</td>
<td>Seeds are removed from fruits and dried in shade. Seeds are packed in air dried boxes and husk of seeds stored in bags.</td>
</tr>
<tr>
<td>Average yield/nali</td>
<td>After third year 10 kg seeds / year (9 gm per plant) and 44 kg dry rhizome 5&lt;sup&gt;th&lt;/sup&gt; year (40 gm per plant)</td>
</tr>
<tr>
<td>Market price</td>
<td>Rs. 350/- to 450/- per kg (seed) and Rs. 80/- to 100/- per kg (Rhizome)</td>
</tr>
<tr>
<td>Cost of cultivation</td>
<td>Rs. 2500/- per Nali seeds in 1&lt;sup&gt;st&lt;/sup&gt; year &amp; Rs. 500/- per year after 1&lt;sup&gt;st&lt;/sup&gt; year</td>
</tr>
<tr>
<td>Gross return</td>
<td>Rs. 14020/- per Nali in 3&lt;sup&gt;rd&lt;/sup&gt; and 5&lt;sup&gt;th&lt;/sup&gt; year</td>
</tr>
<tr>
<td>Net return</td>
<td>Rs. 9520/- per Nali in 5&lt;sup&gt;th&lt;/sup&gt; year</td>
</tr>
<tr>
<td>Average profit</td>
<td>Rs. 1200/- per Nali per year</td>
</tr>
</tbody>
</table>
Different stages of *Gloriosa superba* Linn.

(Peate 9)

<table>
<thead>
<tr>
<th><strong>Vernacular name:</strong></th>
<th><strong>Satavar</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soil:</strong></td>
<td>Well drained sandy clay</td>
</tr>
<tr>
<td><strong>Climate:</strong></td>
<td>Hot and moist subtropical</td>
</tr>
<tr>
<td><strong>Propagation:</strong></td>
<td>Seed and disc</td>
</tr>
<tr>
<td><strong>Germination duration:</strong></td>
<td>20-25 days</td>
</tr>
<tr>
<td><strong>Plants /nali:</strong></td>
<td>150 gm seed per Nali</td>
</tr>
<tr>
<td><strong>Sowing time:</strong></td>
<td>June</td>
</tr>
<tr>
<td><strong>Plantation:</strong></td>
<td>July</td>
</tr>
<tr>
<td><strong>Distance between plants:</strong></td>
<td>60 cm x 60 cm</td>
</tr>
<tr>
<td><strong>Plant number per row:</strong></td>
<td>550 plants</td>
</tr>
<tr>
<td><strong>Harvest duration:</strong></td>
<td>18 months</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td>December-January</td>
</tr>
<tr>
<td><strong>Post Harvest Management:</strong></td>
<td>Root cleaned after removing outer layer and soil, dried in sunlight and stored in jute bags.</td>
</tr>
<tr>
<td><strong>Average yield/nali:</strong></td>
<td>75 kg dry roots (135 gm per plant)</td>
</tr>
<tr>
<td><strong>Market price:</strong></td>
<td>Rs. 30/- to 45/- per kg (dry roots)</td>
</tr>
<tr>
<td><strong>Cost of cultivation:</strong></td>
<td>Rs. 800/- per Nali</td>
</tr>
<tr>
<td><strong>Total profit:</strong></td>
<td>Rs. 2250/- per Nali</td>
</tr>
<tr>
<td><strong>Net profit:</strong></td>
<td>Rs. 1450/- per Nali</td>
</tr>
<tr>
<td><strong>Average profit:</strong></td>
<td>Rs. 725/- per Nali per year</td>
</tr>
</tbody>
</table>
Plate 9

Different stages of *Asparagus racemosus* Willd.
### 7. *Cymbopogon flexuosus* Nees.  
(Plate 10)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vernacular name:</td>
<td>Lemon Grass</td>
</tr>
<tr>
<td>Soil:</td>
<td>Sandy clay or waste land</td>
</tr>
<tr>
<td>Climate:</td>
<td>Hot and moist subtropical</td>
</tr>
<tr>
<td>Altitude:</td>
<td>350-1500 m</td>
</tr>
<tr>
<td>Plants /nali:</td>
<td>550 slips</td>
</tr>
<tr>
<td>Sowing time:</td>
<td>July or February-March (in irrigated soil)</td>
</tr>
<tr>
<td>Distance between plants:</td>
<td>60 cm x 60 cm</td>
</tr>
<tr>
<td>Plant number per row:</td>
<td>550 plants</td>
</tr>
<tr>
<td>Harvest duration:</td>
<td>5 years</td>
</tr>
<tr>
<td>Harvesting:</td>
<td>October, February, May and August</td>
</tr>
<tr>
<td>Post Harvest Management:</td>
<td>Leaves dried for 3-4 days in sunlight, leaves chopped into small pieces before distillation.</td>
</tr>
<tr>
<td>Average yield/nali:</td>
<td>4 kg oil / year</td>
</tr>
<tr>
<td>Market price:</td>
<td>Rs. 300/- to 325/- per kg (oil)</td>
</tr>
<tr>
<td>Cost of cultivation:</td>
<td>Rs. 800/- per nali for 1st year &amp; Rs. 200/- per nali</td>
</tr>
<tr>
<td>Gross return:</td>
<td>Rs. 6000/- per nali per 5 years</td>
</tr>
<tr>
<td>Net return:</td>
<td>Rs. 4000/- per nali per 5 years</td>
</tr>
<tr>
<td>Average profit:</td>
<td>Rs. 880/- per nali per year</td>
</tr>
</tbody>
</table>
Different stages of *Cymbopogon flexuosus* Nees
8. *Matricaria chamomilla* L.  
(Plate 11)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vernacular name:</td>
<td>Chamomile</td>
</tr>
<tr>
<td>Soil:</td>
<td>Light and heavy clay</td>
</tr>
<tr>
<td>Climate:</td>
<td>Cold subtropical and sunny temperate</td>
</tr>
<tr>
<td>Altitude:</td>
<td>350-2500 m</td>
</tr>
<tr>
<td>Propagation:</td>
<td>Seed</td>
</tr>
<tr>
<td>Germination duration:</td>
<td>15-20 days</td>
</tr>
<tr>
<td>Seeds /nali:</td>
<td>20 gm seed</td>
</tr>
<tr>
<td>Sowing time:</td>
<td>September-October (subtropical) February (temperate)</td>
</tr>
<tr>
<td>Plantation:</td>
<td>November (subtropical), March (temperate)</td>
</tr>
<tr>
<td>Distance between plants:</td>
<td>30 cm x 30 cm</td>
</tr>
<tr>
<td>Plant number per row:</td>
<td>2200 plants</td>
</tr>
<tr>
<td>Harvest duration:</td>
<td>5-6 months</td>
</tr>
<tr>
<td>Harvesting:</td>
<td>15 February to 15 April (subtropical), May-June (temperate zone), 5-6 cuttings between a duration of 10 days.</td>
</tr>
<tr>
<td>Post Harvest Management:</td>
<td>Flowers dried in moderate sunlight, stored in air tight boxes after drying at 40-45°C</td>
</tr>
<tr>
<td>Average yield/nali:</td>
<td>100 kg fresh flower or 20 kg dry flower</td>
</tr>
<tr>
<td>Market price:</td>
<td>Rs. 60/- per kg (dry flower)</td>
</tr>
<tr>
<td>Cost of cultivation:</td>
<td>Rs. 500/- per Nali</td>
</tr>
<tr>
<td>Total profit:</td>
<td>Rs. 1200/- per Nali</td>
</tr>
<tr>
<td>Net profit:</td>
<td>Rs. 700/- per Nali with 5-6 months</td>
</tr>
</tbody>
</table>
Plate 11

Different stages of *Matricaria chamomilla* Linn.
9. *Rubia cordifolia* Linn. (Plate 12)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vernacular name:</td>
<td>Manjeeth</td>
</tr>
<tr>
<td>Soil:</td>
<td>Sandy clay with more carbonic elements</td>
</tr>
<tr>
<td>Climate:</td>
<td>Light cold and dry temperate region</td>
</tr>
<tr>
<td>Altitude:</td>
<td>800-2800 m</td>
</tr>
<tr>
<td>Propagation:</td>
<td>Seed</td>
</tr>
<tr>
<td>Germination duration:</td>
<td>20-25 days</td>
</tr>
<tr>
<td>Seeds /nali:</td>
<td>50 gm seed</td>
</tr>
<tr>
<td>Sowing time:</td>
<td>May-June</td>
</tr>
<tr>
<td>Plantation:</td>
<td>July</td>
</tr>
<tr>
<td>Distance between plants:</td>
<td>40 cm x 20 cm</td>
</tr>
<tr>
<td>Plant number per row:</td>
<td>2500 plants</td>
</tr>
<tr>
<td>Harvest duration:</td>
<td>2 year and 6 months after plantation</td>
</tr>
<tr>
<td>Harvesting:</td>
<td>November-December</td>
</tr>
<tr>
<td>Post Harvest Management:</td>
<td>The roots would be cut into small pieces after proper washing. After grading they were dried into partial shadow and stored into the gunny bags.</td>
</tr>
<tr>
<td>Average yield/nali:</td>
<td>62 kg dry roots (25 gm/plant)</td>
</tr>
<tr>
<td>Market price:</td>
<td>Rs. 60-80 / kg (dry roots)</td>
</tr>
<tr>
<td>Cost of cultivation:</td>
<td>Rs. 1000/- per nali</td>
</tr>
<tr>
<td>Total profit:</td>
<td>Rs. 3720/- per nali</td>
</tr>
<tr>
<td>Net profit:</td>
<td>Rs. 2720/- per nali</td>
</tr>
<tr>
<td>Average profit:</td>
<td>Rs. 900/- per nali / year</td>
</tr>
</tbody>
</table>
Plate 12

Different stages of *Rubia cordifolia* Linn.
10. *Amomum subulatum* Roxb. (Plate 13)

Vernacular name: Bari Ilaichi

Soil: Moist clay

Climate: Moist and shady forests of *Quercus* spp. and *Alnus* spp.

Altitude: Jongu golse (900-1100 m), Savne (1100-1500 m)

Varlano (1500-2000 m)

Propagation: Seed and sucker

Seeds /nali: 20 gm seed

Sowing time: October-November

Germination: March

Transplantation: July

Plantation: July (next year)

Distance between plants: 1.5 m x 1.5 m

Plant number per row: 80 plants

Harvest duration: 10 years

Harvesting: October-November

Post Harvest Management: Ripe fruits can be dried into the shadow or through machine and stored in proper place.

Average yield/nali: After 3 years 10 kg dry fruits (125 gm/plant) per year

Market price: Rs. 150-200 / kg (dry fruits)

Cost of cultivation: Rs. 800/- per nali

Total profit: Rs. 12000/- per nali in 10 years

Net profit: Rs. 11200/- per nali in 10 years

Average profit: Rs. 1120/- per nali / year
Different stages of *Amomum subulatum* Roxb.
11. *Silybum marianum* Gaertn. (Plate 14)

Vernacular name: Silibum

Soil: Sandy clay with good drainage facility

Climate: Central sub-tropical region

Altitude: 350-1000 m

Propagation: Seed

Germination duration: 10-15 days

Seeds /nali: 75 gm seed

Sowing time: October

Distance between plants: 60 cm x 60 cm

Plant number per row: 550 plants

Harvest duration: 6 months (October to March)

Harvesting: March-April

Post Harvest Management: After wearing hard hand gloves, ripe fruits would be plucked and separate them by thressor and dry in the sun light and stored properly.

Average yield/nali: 17 kg seeds (31 gm/plant)

Market price: Rs. 75-100 / kg (seed)

Cost of cultivation: Rs. 500/- per nali

Total profit: Rs. 1275/- per nali

Net profit: Rs. 775/- per nali in 5 months
Different stages of *Silybum marianum* Gaertn.

(Plate 15)

<table>
<thead>
<tr>
<th>Vernacular name:</th>
<th>Stevia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil:</td>
<td>Fertile sandy clay</td>
</tr>
<tr>
<td>Climate:</td>
<td>Moist sub-tropical to lower temperate region</td>
</tr>
<tr>
<td>Altitude:</td>
<td>350-2200 m</td>
</tr>
<tr>
<td>Propagation:</td>
<td>Seed and stem cutting</td>
</tr>
<tr>
<td>Germination duration:</td>
<td>10-15 days</td>
</tr>
<tr>
<td>Seeds /nali:</td>
<td>50 gm seed</td>
</tr>
<tr>
<td>Sowing time:</td>
<td>January-February</td>
</tr>
<tr>
<td>Plantation:</td>
<td>July or February March (irrigated region)</td>
</tr>
<tr>
<td>Distance between plants:</td>
<td>45 cm x 30 cm</td>
</tr>
<tr>
<td>Plant number per row:</td>
<td>1450 plants</td>
</tr>
<tr>
<td>Harvest duration:</td>
<td>5 years (3 harvestings per year)</td>
</tr>
<tr>
<td>Harvesting:</td>
<td>September (before flowering), April and June</td>
</tr>
<tr>
<td>Post Harvest Management:</td>
<td>Cut leaves should be dry in the partial sun light and stored properly.</td>
</tr>
<tr>
<td>Average yield/nali:</td>
<td>24 kg dry leaves / year (17 gm dry leaves/plant)</td>
</tr>
<tr>
<td>Market price:</td>
<td>Rs. 100-125 / kg (dry leaves)</td>
</tr>
<tr>
<td>Cost of cultivation:</td>
<td>Rs. 2000/- per nali first year then Rs. 500/- per year</td>
</tr>
<tr>
<td>Total profit:</td>
<td>Rs. 12000/- per nali in 5 years</td>
</tr>
<tr>
<td>Net profit:</td>
<td>Rs. 8000/- per nali in 5 years</td>
</tr>
<tr>
<td>Average profit:</td>
<td>Rs. 1600/- per nali / year</td>
</tr>
</tbody>
</table>
Different stages of *Stevia rebaudiana* (Bertoni) Hemsl.