CHAPTER VII

PLANT REPRODUCTIVE

Introduction

As explained in chapter III the commercially important forests of Jammu and Kashmir State are composed almost entirely of conifer species like deodar (Cedrus deodara), kail (Pinus wallichiana), fir (Abies pindrow and chir (Pinus roxburghii). Other important species like Acacia catechu, Dalbergia sissoo, Acacia modesta, Acacia arabica, Zannea grandis, Cedrela toona, Eugenia jambolana, etc. extending from the foot hills of Jiwali to the foot hills of the Himalayas, have degraded to the extent that they should be included in the scrub forests of the state. Part from these, species like bird cherry, walnut, elm, ash, horse-chestnut etc. occur in patches in nallas, shady depressions and moist areas. Again, certain undergrowth of shrubs are associated with different conifer formations such as Indigofera and Plantachrus rugosus in deodar-kail forests and Viburnum and Spiraea- sordifolia in fir forests. All these forests belong to various groups of Champion's forest types of India (see chapter II). Further, these forests extend over the areas lying between 300 m to nearly 3400 m and enjoying from monsoonic to temperate and even alpine type of climates.
It is in these altitudinal and climatic variations that the herbaceous flora is very rich in variety and number of species ran in to hundreds. The general climate of Kashmir is conducive to the growth of wide range of plants of medicinal and other value.¹

Thus the forests of the state are not only important for yielding large volume of commercial timber but are also known for number of commercially useful plants. a e., therefore, come to differentiate two categories of forests, viz. one yielding timber and the other yielding products other than timber.

It is generally recognised that all the forest products, other than timber, are referred to as 'minor forest products' or as they are commonly called. These, apart from being valuable, give employment to large number of people, particularly to the large section of population living in and round forest areas who set part time jobs in the collection of minor forest products. Thus the process of collection of from the forests helps in generating considerable volume of employment potential of various categories both in and outside the forests.²

These minor forest products were once unrecognized for pretty long time in the history of Jammu and Kashmir forestry but now they have become a profitable enterprise due largely to the demand from various quarters of industry. But, still the minor forest products usually get low priority due to their negligible contribution to the overall revenue of the forest department. The value of such minor forest products, however, cannot be minimized because these constitute important raw materials for various industries. The recent popularity of Ayurvedic and Unani system of medicines have increased the demand of these products in India. Their importance, therefore, cannot be judged by the money they fetch but by the service they render to the society.

The minor forest products of the state can be categorized as follows:

1. Medicinal plants
2. Aromatic and essential oil bearing products
3. Gums and gum-oleo-resins
4. Spices and condiments
5. Cutch and leather tanning materials
6. Edible materials
7. Oil seeds

Although a large number of plants of medicinal importance are found in Jammu and Kashmir state, only those serving as raw materials for drug and pharmaceutical industry or consumed on large scale in the Indian system of medicines have been taken into account. Aromatic and essential oils enjoy considerable importance in aroma-chemicals and as ingredients for perfume, flavour and cosmetic industries. Similarly gums are used in confectionery, in cotton and textile and in paper industry for sizing the paper. Only certain most important gum yielding plants have been discussed. There are quite a number of plants growing wild in the forests of Jammu and Kashmir yielding spices and condiments but only the two most important among them have been discussed here. This is largely because of the non-availability of required data from any source about the other plants such as keer, sish-zira etc.

According to investigations carried out by the Regional Research Laboratory, Jammu, the state's flora is quite rich in vegetable tanning materials, but it has not yet been possible to assess this forest resource. However a number of plants which serve as raw materials for leather tanning.

4. Information based on verbal discussion with I.C. Jari of K.K., Jammu.
units in Jammu and Kashmir state and are among the important trees yielding cutch and tanning material have been discussed.

Although there are quite a great number of plants growing wild which serve as edible materials, the forest department has not yet been able to assess their potential.

The following table (Table 7.1) will show the trade and botanical names of the plant categories mentioned above and the parts of these plants which are used.

Table 7.1

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Part Used</th>
<th>Botanical Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mohand or Mohri</td>
<td>Root</td>
<td>Acotinum Cheesmanthum</td>
</tr>
<tr>
<td>Beski</td>
<td>Herb</td>
<td>Artemisia maritima</td>
</tr>
<tr>
<td>Heladona</td>
<td>Root/leaf</td>
<td>Atropa acuminate</td>
</tr>
<tr>
<td>Rasaunt</td>
<td>Root</td>
<td>Berberis lycium</td>
</tr>
<tr>
<td>Zakhm-i-Shayat</td>
<td>Rhizome</td>
<td>Bergenia applaudata</td>
</tr>
<tr>
<td>Shuranjan</td>
<td>Corm</td>
<td>Colchicum leuca</td>
</tr>
<tr>
<td>Datura</td>
<td>Seed/Leaves</td>
<td>Latura stramonium</td>
</tr>
<tr>
<td>Zina</td>
<td>Rhizome</td>
<td>Ilioscorea deltoidea</td>
</tr>
<tr>
<td>Asmanibuti</td>
<td>Stem</td>
<td>Ephedra gerardiana</td>
</tr>
<tr>
<td>Kuindal</td>
<td>Rhizome</td>
<td>Neracleum candidum</td>
</tr>
<tr>
<td>Name</td>
<td>Part</td>
<td>Scientific Name</td>
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<tr>
<td>----------------</td>
<td>-----------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Bazarbeng</td>
<td>Leaf</td>
<td>Hyoscyamus niger</td>
</tr>
<tr>
<td>Bodina</td>
<td>Herb</td>
<td>Pentha longifolia</td>
</tr>
<tr>
<td>Kour</td>
<td>Rhizome</td>
<td>Microhiza kurrooa</td>
</tr>
<tr>
<td>Banaskri</td>
<td>Rhizome</td>
<td>Codophyllum hexandrum</td>
</tr>
<tr>
<td>Revand</td>
<td>Rhizome</td>
<td>Rheum endodi</td>
</tr>
<tr>
<td>Benafsha</td>
<td>Herb</td>
<td>Vrata oederata</td>
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</table>

**Aromatic and Essential Oil**

<table>
<thead>
<tr>
<th>Name</th>
<th>Part</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chura</td>
<td>Rhizome</td>
<td>Archangeliaca officinalis</td>
</tr>
<tr>
<td>Neodar</td>
<td>Saw dust</td>
<td>Cedrus deodora</td>
</tr>
<tr>
<td>Ashap</td>
<td>Roots</td>
<td>Jurina macrocephala</td>
</tr>
<tr>
<td>Matter or Surra</td>
<td>Leaf</td>
<td>Siderita laurula</td>
</tr>
<tr>
<td>Autt</td>
<td>Root</td>
<td>Bauhsea lapla</td>
</tr>
<tr>
<td>Bushatala</td>
<td>Root</td>
<td>Valeriana carlii</td>
</tr>
<tr>
<td>Timroo</td>
<td>Fruit</td>
<td>Zanthoxylum alatum</td>
</tr>
</tbody>
</table>

**Gums**

<table>
<thead>
<tr>
<th>Name</th>
<th>Resin</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chulai gum</td>
<td>Resin</td>
<td>Acacia modesta</td>
</tr>
<tr>
<td>Hing</td>
<td>Resin</td>
<td>Ferula parthex</td>
</tr>
<tr>
<td>Zeimbrel</td>
<td>Gum</td>
<td>Lannea coromandlicia</td>
</tr>
<tr>
<td>Chir gum</td>
<td>Resin</td>
<td>Einusroxbur.kii</td>
</tr>
</tbody>
</table>
Spices and Candiments

- **Neer**
  - Leaves: *Allium stracheyi*
- **Badian**
  - Fruit: *Frasneos pubularia*
- **Anordana**
  - Fruit seed: *Unica granatum*

Cutch and Tanning Materials

- **Katha**
  - Extract: *Acacia catechu*
- **Amla**
  - Fruit: *Embatica officinalis*
- **Taru**
  - Fruit rind: *Unica granatum*
- **Shayi**
  - Flowers: *Woodfordia fracticosa*

Edible Materials

- **Amloki**
  - Fruit: * Diospyros kaki*
- **Gucchi**
  - Whole mushroom: *Porcheala esculenta*

Oil Seeds

- **Chirandi**
  - Seed: *Litssea umbrosa*
- **Camila**
  - Seed: *Hallingus philippenensis*
- **Terpin**
  - Fruit: *Aspium sebiferum*

Table 7.2 and 7.3 will show the average out turn and occurrence of these minor forest products respectively. The details of their description as gathered from various
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<tr>
<th><strong>GUMS</strong></th>
<th><strong>Resin</strong></th>
<th><strong>Remarks</strong></th>
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<tbody>
<tr>
<td>Acacia modesta</td>
<td>Phulai</td>
<td>Resin</td>
</tr>
<tr>
<td><em>Perula narthex</em></td>
<td>Ning</td>
<td>Resin</td>
</tr>
<tr>
<td><em>Lannea coromandelica</em></td>
<td>Kaizbal</td>
<td>Gum</td>
</tr>
<tr>
<td><em>Pinus roxburghii</em></td>
<td>Chir</td>
<td>Oleo resin</td>
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<table>
<thead>
<tr>
<th><strong>SPICES AND CARDAMOM</strong></th>
<th><strong>Remarks</strong></th>
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</thead>
<tbody>
<tr>
<td><em>Pracnos pabularea</em></td>
<td>Sadian</td>
</tr>
<tr>
<td><em>Punica granatum</em></td>
<td>Daru</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>CUTIC AND TAXING MATERIALS</strong></th>
<th><strong>Remarks</strong></th>
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</thead>
<tbody>
<tr>
<td><em>Acacia catechu</em></td>
<td>Katha</td>
</tr>
<tr>
<td><em>Amla</em></td>
<td>Amla</td>
</tr>
<tr>
<td><em>Woodfordia fruticosa</em></td>
<td>Phayi</td>
</tr>
<tr>
<td><em>Punica granatum</em></td>
<td>Daru</td>
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<table>
<thead>
<tr>
<th><strong>MEDICINAL</strong></th>
<th><strong>Remarks</strong></th>
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</thead>
<tbody>
<tr>
<td><em>Diospyros kaki</em></td>
<td>Amluk</td>
</tr>
<tr>
<td><em>Acorchea esculenta</em></td>
<td>Guachi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>OIL SEEDS</strong></th>
<th><strong>Remarks</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Litsaea umbrosa</em></td>
<td>Chirandi</td>
</tr>
<tr>
<td><em>Falletus philippensis</em></td>
<td>Kaizla</td>
</tr>
</tbody>
</table>
books and unpublished literature, annual administration reports, official records and a dictionary listed in the bibliography are given in the following pages. As regards their distribution over the territories of Jammu and Kashmir, the main sources of information have been the Divisional Forest Officers (D.F.O.) and their official records.

**Medicinal Plants**

*Acotinum chesmanthum*, known as Pohand in Kashmiri, and Kohri in Hindi and *Acotinum- heterophyllum*, known in Hindi and Kashmiri as Katis, belong to the family of **Hanaceluaceae**. The plant is 30-90 cm tall. These plants occur overlapping each other in sub-alpine to alpine zone from 2100-4000 m. The important areas of their occurrence being Ganderbal-Amarnath and above Culmarg.

The rhizomes of these plants yield an alkaloid aconitine used mainly as an external applicant for neuralgia. It effects adversely when used orally and, therefore, oral use is prescribed only by homeopaths under specific conditions.

*Artemisia maritima* is called Beksi in Kashmiri,artonin is its trade name. The plant is about 0.5 to 1 m in height and has whitish leaves. It grows wild in the Guraiz valley in Kashmir and the Kishwar forest division of Chenab forest circle in Jammu province between 1600 m to 2700
<table>
<thead>
<tr>
<th>Month</th>
<th>1900-2000</th>
<th>2000-3900</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>0001-0050</td>
<td>0006-0100</td>
</tr>
<tr>
<td>February</td>
<td>0006-0100</td>
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<tr>
<td>December</td>
<td>0060-0700</td>
<td>0070-0800</td>
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*Table 7 (cont...)*
The plant contains santonin contents up to 1.5 per cent in its young leaves and flower heads. The main use of santonin is as a vermifuge but it is also effectively used as a heart stimulant.

*Atropa acuminate* is known mostly by its trade name of Belladona. It occurs widely between 2000 m to 3000 m elevation in the Bhaderwah the Poda, the Aishtwar division of the Chenab valley and Sœonch (oil conservation) division of Jammu circle. It is also found in the Jhelum Valley forest division of Kashmir province.

Alkaloids hyoscyamine and atropine are derived from *Atropa acuminate* leaves and the roots of the plant are used for sedation and antispasmodic purposes whereas atropine has ophthalmic uses. The roots of the plant on the other hand are also used as anodynes for rheumatism, neuralgia and for local inflammation.

*Berberis lycium* is known commonly as Khasaunt and *Berberis* is its trade name. This is a medium sized thorny shrub. It occurs between 2000 to 3000 m all over the valley in general and Kama and Prawah in particular it also occurs in the Udhampur and the Hillwar forest division in large quantities.
The stem, the bark and the roots of the plant yield an alkaloid which is used in the treatment of eye ailments, piles and malaria.

*Sergenia ligulata* is a small plant which has leaves about at 0.25 m. It grows between 2100 m to 3050 m above sea level. It is found throughout the state in its natural habitat.

An alkaloid derived from the rhizomes of the plant is used in fevers, diarrhoea and cough.

*Colchicum luteum* is known as Suranjan in Kashmiri and its Hindi equivalent is Mirantotia. It is a herb having narrow leaves which broaden towards the tip with corms of brownish colour and conical in shape. This herb occurs between 1500 to 2400 m above sea level in Jammu and Kashmir state near Srinagar and Tragbal. It generally grows in grass meadows and around forest margins in Chenab and Kashmir circles, particularly in low oak-coniferous zone.

An alkaloid is derived from the corm seeds of *Colchicum luteum* is also used for the treatment of gout.

*Satureja stramonium*, which is called *Satur* in Kashmiri and *Sature* in Hindi, happens to be a bush attaining a height of 1.5 m. Leaves are ovate and toothed. It is generally found between 1600 to 2400 m elevation mostly in Kashmir.
valley but is also collected from Billawar and all the forest divisions of Chenab valley.

The plant yield two alkaloids, namely hyoscyamine and a small quantity of atropine. They are put to the similar uses as the alkaloid derived from \textit{Atropa acuminate}.

\textit{Dioscora deltoidea}, known as dina or creens, is a climber which occurs in clusters or solitary but in abundance in Yerazpur Ballah in Gujranwala. It is also found in Chenab between 1600 m to 2400 m elevation. It also occurs in the Chenab valley forest circle.

The plant yields diojenin content to the extent of 3-5 per cent, which is quite high. The content is highly useful for preparing sex hormones and oral contraceptives.

\textit{Eschdera gerardiana} is known as greeni bati both in Hindi and Kashmiri. It is about one metre high and is a much branched shrub. It occurs in the Chenab valley forest division and in Ladakh at an elevation of 2000 to 4000 m. Ephedrine alkaloid derived from the plant is used in the treatment of asthma and similar other respiratory troubles. It is also used as a heart stimulant.

\textit{Heracleum candicans}, known locally as Kunda, is a small herb with pinnately divided leaves. The plant occurs
in blanks in deodar-kail zone of Chenab forest circle and in the whole of the Kashmir valley in its natural habitat, particularly in the Jhelum valley forest division. Furano-coumarins is obtained from the plant to be used as a base for the synthesis of xanthotoxin, a medicine which cures leucoderma. It is also used in the sun-tan lotions.

*M. moschata*, known as Hazarbang in Kashmiri and Ajwain Khurasani in Hindi, is a bad smelling bush. It is both an annual and biennial herb which is sparsely branched. It occurs throughout the Kashmir valley between 1600 m to 2700 m, particularly on the forest blanks. Myosamine is derived from the plant which possesses antiseptic, sedative, anodyne, mydriatic and narcotic properties. It is used in asthma and whooping cough. It also has spasmodic properties in addition to the ones mentioned above.

*Mentha longifolia*, known both in Kashmiri and Hindi as Rodina, is 15-30 cm. high, hairy plant usually found near wet areas from 1500 m to 3000 m throughout Jammu and Kashmir state. It is a source of medicinal oil, particularly menthol or peppermint oil.

*Microhiza kurrooa*, called kour in Kashmiri and kathi in Hindi, is a small herb with setate shaped leaves 5 to 10 cm long. The herb occurs between 3000 m to 4000 m in Holohai
and Zojpal and other margs in Kashmir and throughout the Chenab forest circle in its natural habitat.

Bitter tonic obtained from the rhizome of the plant is useful as an antiperiodic and promotes bile secretion. It is used in fever and dyspepsia. It is also used in the preparation for treating scorpion sting.

*Pistacia integriring*, known as Kesarsinghi in Kashmiri and Tar in Hindi, is nearly a glabrous and tall tree. It attains a height of more than 12 metres. It occurs between 350m to 2450m elevation above sea level. In Jammu and Kashmir it is found growing on hot slopes in the Kishtwar the Jhampur, the Billawar and the Majouri forest divisions in particular and other forest divisions of Chenab and Jammu forest circles in general.

In the leaves of the plant, hard rugose, hallow, irregular galls are found in the month of October which are used for dyeing and tanning. These galls are medicinally important too as they are considered to be a tonic and expectorant and are useful in asthma, fever and as an appetite.

*Podophyllum hexandrum*, known as Bankakri or Banwagon in Kashmiri and Ben-Baigan or Papri in Hindi, is a succulent, erect herb. It occurs throughout the forests of the Kashmir
valley from 1800-3000 m, particularly in Culmarg and Guraiz areas. In Jammu province it is collected from the Shaderwah, the Kamben, the Kishtwar, the Keesi and the Billawar forest divisions. Resin podophyllum is obtained from the rhizomes of the plant. This drug is used in many diseases of skin and also in tumorous growth.

*Khunmodi*, called *revand* in Kashmiri and *revand Chini* in Hindi, is a tall herb having a stout stem and roots. It occurs from 3000 to 4000 m throughout Kashmir valley and also in Jamian and Panjtari areas of Poonch. It is chiefly used in the treatment of diarrhoea.

**Aromatic and Essential Oils**

*Archangelica officinalis*, locally known as *Chara*, occurs throughout the Kashmir valley over fir and alpine zone in general and in the Jhelum and the Kashmir forest divisions in particular. Angel oil derived from the roots of the plant is used in wine and brewery industry and is readily acceptable by various essential oil distillers.

*Cedarwood-sawdust and waste* is the source of cedarwood oil used as industrial perfume. The oil is derived both from cedarwood saw dust, off-cuts and stump chips after distillation. At present the oil is produced by a number of small scale industries in the private sector in various
parts of the state of Jammu and Kashmir.

*Jurinea macrocephala*, known as Dhup both in Hindi and Kashmiri, is a perennial stemless plant having woody roots. It generally occurs above 3000 m elevation in all the forest divisions of Chenab circle, in the Udhampur the Billawar and the Poonch soil conservation divisions in Jammu province and the Kashmir, the Pir Panjal and the Jhelum valley forest division of the Kashmir valley. The roots of the plant are used in the manufacture of incense sticks and burnt in temples and other religious places and functions. It is well known for healing wounds.

*Skimmia laurosala*, called Katari in Kashmiri and Bara in Hindi, is an evergreen aromatic and glamorous shrub, 90 cm to 1.5 m in height. It occurs from 2000 m to 2700 m throughout Jammu and Kashmir state. But its collection between 1971-72 to 1976-77 has only been reported from the Billawar forest division and that too for the year 1973-74. An essential oil is derived from the leaves which may be used in the perfumery industry and for the manufacture of soap. Like Dhup (*Jurinea macrocephala*) it is also used in Hindu rituals due to its fragrant leaves.

*Laurus lappa*, called Kut both in Hindi and Kashmiri, is a perennial herb, about 1.5 to 2 m. in height and having very large leaves.
It is generally found growing between 2500m and 4000 m on well drained soils. In the Kashmir valley it grows in the sir sanjal, the sanget, the kashmir, the kamraj and the jindh forest divisions as well as the entire Chenab forest circle. It is also found growing in the Bilawar and the poonch (soil conservation) divisions of Jammu circles. The plant is put to a variety of uses. The oil derived from the roots of the plant has a insect repelling property which helps in storing woolens without tarnishing the gold thread or embroidery on them. But its chief use lies in its medicinal value. It has antiseptic and disinfectant properties. It gives relief to bronchial asthma patients.

*Valeriana wallichii*, known as kushk-bala both in Hindi and Kashmiri is, a plant having yellowish brown rhizomes. It occurs between 1800 m to 2000 m throughout the Kashmir valley. It also grows throughout the Chenab forest circle and the Udhampur the Bilawar the Poonch (U.C.), and the Jammu (U.C.) divisions in the Jammu province.

Volatile oil is obtained from the roots of the plant. These roots also possess stimulative, carminative and antiseptic properties which are useful in hysteria, epilepsy and neurosis.
*Zanthoxylum alatum* is a small tree with dense foliage, possessing a pungent, aromatic taste and small. It is commonly known as Timroo. It generally occurs in hot valleys in sub-tropical Himalayas between 600 m to 900 m. Its collection has not been reported by any forest division of the state but it occurs in the Jammu, the Poonch (C.C.), the Billawar the Udhampur, the Loa and the Ramban forest division of Jammu province. An essential oil can be derived from carpels and fruits which act as a valuable antiseptic and disinfectant.

**Gums**

*Acacia modesta* or *Chulai* as it is called in Punjabi, is a moderate sized thorny tree. It attains a maximum height of about 9 m. It’s bark is rough, the wood is very heavy, straight grained and fine textured.

In Jammu and Kashmir it occurs on the lower portions of the Billawar, the Jammu, the Udhampur the Reasi and the Jouri forest divisions, gradually decreasing from east (Billawar) to west (Jouri).

It’s translucent and pale yellowish gum is mostly used in medicines and confectionery. It’s tender twigs are used as ‘latun’ for cleaning teeth.
**Ferula narthex** is a herb with circular mass of foliage. It may grow to 1.8 m in diameter. In Jammu and Kashmir it grows in Ladakh area. The oleo-gum-resin is collected from the stem in June when the fruit is unripe and from the roots in July-August. The gum is used for sizing paper and cloth etc.

.. sort of gum, commercially known as asafoetida, is obtained from the roots of the plant which is used as an antiseptic, nervine stimulant, digestive, sedative, expectorant, diuretic, anthelmintic and emmenagogue etc.

**Lannea coromandelica**, known in Kashmiri and Hindi as Khimbal or Khimil, is a deciduous tree having stout branches which normally attain a height of 24 m. It occurs in the Kashmir, Udhampur the hajouri and the Jammu (..C.) and the billawar forest divisions between 600 to 900 m. It's wood is put to various uses but its gum which is yellowish white when fresh and turn brown and finally black on drying, is also used in various industries. Fresh gum which is soluble in water possesses good adhesive properties. The gum is also used in calico-printing, paper and cloth sizing, inferior varnishes and inks. It is also used in plastering and white washing apart from being used in confectionery and for preserving fishing nets.
**Pinus roxburghii**, commonly called as chir pine, is a large coniferous tree. It occurs in outer and drier Himalayas between 500 m to 1500 m. In Jammu and Kashmir state it occurs throughout the Jammu forest circle and the Ramzan, the Reasi, and the Poda forest divisions of Chenab forest circle. It is totally absent in the Kashmir Valley. The oleo-resin is generally procured from the tree by making an incision. The oleo-resin further releases many important by products used for a variety of purposes (see chapter VII) in various industries manufacturing soaps, disinfectants, paints, varnishes, paper etc.

**Spices and Condiments**

**Pimpinella papularia** known locally as Badian is a perennial herb. It occurs between 1800 to 3350 m throughout the valley of Kashmir. Its collection has also been reported from Jhampur and Illawar forest division of Jammu forest circle.

The roots of the plant are considered as diuretic and emmenagogue and a valuable external application for itch. It can also act as an efficient antiseptic wash. The wash is also used as fodder for sheep and goats but the plant is poisonous to lower animal life.
*Funicia granatum*, known locally as Laru, is a small tree which sometimes can be described as a large shrub. It grows wild in stony ground in the Boda, the Ramban, the Baderwan, the Kishtwar, the Reasi, the Billawar contain (S.C.), the Jhalandpur and the Rajouri forest divisions.

The fruit usually as large as an apple has a hard rind of brownish red colour. It contains numerous yellowish seeds which are universally eaten and much esteemed. The seeds of inferior quality fruit are dried to be used for preparing a delicious sauce. The rind of the fruit contains a moderate amount of yellowish colouring matter which is given up easily in the boiling water, giving colour from dull-yellowish green to bright reddish. It contains large quantity of tannic acid which is capable of producing black dye on wool when treated with salt of iron.

**Catching and Tanning Materials**

*Acacia catechu*, katha is a wood extract of *Acacia catechu*, which occurs throughout the Jammu forest circle with in its natural habitat. The katha from *Acacia catechu* is derived in Jammu (S.C.), Jhalandpur, Rajouri and Billawar forest divisions. The product is used primarily for chewing with petal beats. Catch is also obtained by boiling the softer part of the wood which is used as valuable dye in industries.
Emblica officinalis, known locally as Amla, is a small or medium sized deciduous tree. The bark which is smooth has greenish-grey colour. Whereas the foliage is featherly light green. It occurs in the Hillawar, the Jammu, the Udhampur the Heasi, the Sojouri and the Soonch forest divisions.

While its wood is used for a variety of purposes such as furniture making as a cheap building material, for making agricultural implements etc. Its leaves and fruit contain 22 per cent and 21 per cent of tannin respectively. It's bark and twigs contain 8 per cent and 11 per cent tannin respectively. All this is mainly used for tanning leather.

Woodfordia fruticosa, called Ihayi in Hindi and Kashmiri, is a small, much branched shrub owing to its flowers all along its branches it looks brightly purple. It occurs in scrub forest of Jammu, particularly in the Heasi forest division upto a height of 1500 m. It also occurs in the Udhampur and the Hillawar forest division.

The flower of the shrub contain large quantities of tannin. The dry flower of the shrub is stimulant and astringent and are used in bowel complaints and haemorrhages.

Edible Plants

Diospyros kaki, locally known as Amlok, is a tree growing throughout the Chenab valley and Upper reaches of the
Bilawar, the Udhampur, the Sooch (S.C.) and the Rajouri forest division. It also grows in the Kashmir valley the tree is also cultivated, apart from growing wild, in its natural habitat, on account of its fruit which is delicious and often made into preserves. The fruit is exported to Jammu and other cities in India in a dry state. No statistical data pertaining to its production or collection is available either from the forest or from agriculture departments.

I. *orchela esculenta*, known as Gucchis, is in great demand, particularly in European and Arab countries due to its quality of being a fine, though a costly vegetable.

It occurs throughout the Chenab forest circle and upper reaches of the Udhampur the Bilawar, the Rajouri and the Sooch forest divisions. In these areas many farmers have started growing it under artificial conditions with very good results. Being a costly vegetable it can be a source of revenue for the state.

**Lil seeds**

*Itea umbrosa*, known commonly as chirundi, is a small tree. It occurs throughout the temperate forests of Jammu and Kashmir between 900 m to 2100 m. The seed of the plant yields an oil which is used for burning in lamps.
Ballotus philippensis, known locally as mazila, is a tree occurring in the Billawar and parts of the Udampur forest divisions. Oil is extracted from the seed of the tree is suitable for use as an ingredient of varnish and other surface coating materials. The seed yields 25-30 per cent of fixed oil.

Capsicum-sebiferum, called mon-china in Hindi, is a small flabrous tree introduced in India from China. It grows throughout the hotter belt of Jammu province. The seed of the tree is coated with a white greasy substance, called a vegetable tallow. This substance is used for making candles. Further, from the shell and seed an oil is extracted which is burnt in lamps. So statistical data is available with the forest department pertaining to the production or collection of various oil seeds found in the forests of Jammu and Kashmir.

The above described are only a small number of plants constituting the minor forest products. Other plants of importance have either not been studied, surveyed and analysed or are not collected on a large scale. The latter include aitchison, bamboo, catateria, gertheri, kambeti, langatari, poshaar, reyil and saemul to name only a few.

The forests of Jammu and Kashmir, therefore, possess a great potential for minor forest products, providing raw
materials for a number of industries. From the commercial point of view resin (chir resin) is the most important and which is being dealt with separately. Medicinal plants seem to occupy the second most important place among the of the Jammu and Kashmir State. Although synthetic drugs can be a suitable substitute for the various medicinal plants, a sustained supply of these will certainly be preferable for it is well known that nature can neither be surpassed nor matched. For maintaining a sustained supply of the medicinal plants the forest department should carefully survey the potentials and find out the ways for maintaining the growing stock at a uniform level. As the department lays down working plans for the exploitation of timber, taking into consideration all aspects of forestry, similar working plans can also be drawn for the exploitation of minor forest products. This will help in obtaining the maximum yield with proper natural regeneration which will not allow the resources to deplete. On the other hand this will help the department to get information about the stock and quantity available for supply on a sustained yield basis, and if the necessity so arises cultivation of some medicinal plants can also be undertaken in drug farm as is done at present at certain places. Research facilities available at the Regional Research Laboratories, Jammu and Srinagar,
should suitably be exploited for the benefit of society.

Some drug plants of great commercial value like *Dioscorea, Erucastrum, Belladona, Artemisia* and *Suth* etc. are indigenous to the state. Their cultivation at present is not being allowed in the private sector under the Suth act. Their cultivation in the private sector, under the supervision of forest department, can be a source of additional revenue to the state.

All these factors will not only go a long way to augment the production of A.F.R. they will also be an instrument of increasing the employment potentials in a poor and backward state like Jammu and Kashmir where new avenues of employment have to be created and existing ones expanded in order to raise the income of the poor masses. ... which as we have seen, are distributed throughout the state right from the foothills of Siwaliks to the Adsah region, can provide jobs to many thousands and side business to even a large number.

If the industrial sector can be assured of a sustained supply of A.F.R., various industries processing these products can be established, giving employment to many thousand people. Moreover, many more people particularly the nomadic tribes roaming in these forests, will undoubtedly
get part time jobs of collecting the S.F.R. Thus these weaker sections of society will greatly be benefited economically.

A process developed by the Regional Research Laboratory, Jammu, for the first time in the world for making hardboard out of fibres made from the pine needles can generate considerable employment potential.

At present there is only one pharmaceutical industry at Baramulla which processes Artemisia maritima for santonin. Any more similar industries based on S.F.R. can be established for the welfare of society.

Timber waste, such as sawdust, end parts of the timber and left over timber in the forests, particularly deodar timber, can sustain many industries manufacturing deodar oil and thus creating employment opportunities.

We have also seen that Jammu and Kashmir forests also possess a rich vegetable tanning material. Many tanning units can be set up.

These are only a few examples but many more avenues are open for economically exploiting of the minor forest products of Jammu and Kashmir.

5. Information based on the verbal discussion with Y.A. Jerin of F.H.L., Jammu.
The present study has revealed that the distribution of forest types in Jammu and Kashmir State, as elsewhere, depends mainly on climate, altitude, soil, geology and aspect etc. Since the Sivalik hills possess sandy soils and comparatively less height, these are covered by Tropical Dry Deciduous Forest, Sub-tropical Dry Evergreen Forest and the Sivalik Chir pine Forest. The effect of climate is clearly discernible when we find no chir pine in the Kashmir valley because chir pine seeds germinate only in the monsoon season. This is not possible in the Kashmir valley because of the absence of good and sustained monsoon rains. Similarly deodar which does not like wet and waterlogged soils does not happily stand on the northern side of Pir Panjal range where due to gentle slope well drained soils are absent. Champion's group 12, 13, 14, 15 and 16 extensively exist on the higher reaches of middle and inner Himalayas. The distribution of these groups and their sub-groups is again influenced by the various locality factors.

As regards the distribution of important forest species the present study reveals that more than 64 per cent of the area under deodar species lies in four forest
divisions only (Langat, Kamraj, Bhaderwah and Doda) thereby showing quite an uneven distribution of this species in the state. Similarly more than 68 per cent of deodar population lies in these four divisions whereas density per hactare of deodar is the highest in the Bhaderwah, Udhampur and Jhelum valley forest divisions. It is further shown by the study that about 40 per cent of tree population stand on about 28 per cent of area under this crop in the Bhaderwah, the Udhampur and Jhelum valley forest divisions.

In case of kail (Pinus wallichiana), the distribution is again uneven. More than 35 per cent of total area under kail lies in the two forest divisions of the Kashmir and the Doda. The Langat, the Kamraj, the Sind, the Pir Panjal, the Kishtwar the Bhaderwah and the Ramban forest divisions extending diagonally from North-West to South-East, together occupy 51.59 per cent of total area under kail. The remaining areas are still unevenly distributed in other forest divisions of the state. Similarly the tree population of kail is also unevenly distributed 53.26 per cent of kail population stand in the three divisions of Bhaderwah, Doda and Kashmir which together occupy 43.33 per cent of the area under this crop. The Langat, the Kamraj and the Sind forest divisions accommodate 14.89 per cent of kail population on 22.84 per cent of area under this species in
the state. The study further reveals that 17.68 per cent of total kail population stands in the Kashmir forest division alone. The remaining 13.29 per cent population stands in the Jhelum valley and Pir Panjal forest divisions. It has further been shown that kail is less important species in Jammu forest circle except the Udhampur forest division. The highest density of kail per hectare is seen in the Udhampur and the Doda forest divisions where 153 and 162 trees stand respectively on a hectare of land. The lowest density of 11 trees per hectare of area is seen in the Sind forest division. The Langt, the Kamraj, the Kashmir, the Kishwar and the Kamban forest divisions stand out as a region where density of kail per hectare varies between 50 to 100 trees.

Out of the total area of about 2.66 lakh hectare under fir in the state 37.62 per cent lies in the three forest divisions of Pir Panjal, Kashmir and Doda showing thereby an uneven distribution of areas. The Langt, the Rajouri and the Poonch forest divisions on the other hand together occupy 17.22 per cent of the areas under fir in the state. The results show that even such important forest divisions like the Bhaderwah, the Kishwar and the Sind individually occupy less than 7 per cent of the total area under fir. The analytical study has brought another interesting point to light which shows that although the
maximum areas under fir lie in the Pir Panjal, the Kashmir and the Doda forest divisions but the concentration of population is in the Bhaderwah and the Doda forest divisions which together accommodate 39.32 per cent of total fir population. It has also been concluded that in the Langt, the Kamraj and the Sind forest divisions fir population is quite thin which is evident from the fact that in these divisions 4.17 per cent of population stands over 18.94 per cent of the total area under this crop in the state. The density pattern of fir per hectare reveal a different pattern in which the Loda forest division, which accounts for 21.67 per cent of the population, has 94 trees per hectare while the Udhampur forest division, which possesses only 3.90 per cent of fir population accommodates 129 trees per hectare. Still higher density per hectare is evidenced in the Bhaderwah forest division where it is found that 149 trees exist over a hectare of land which is the highest in the state. The Reasi, the Pir Panjal the Ramban, the Billawar, the Kajouri and the Poonch forest divisions individually possesses less than 50 trees per hectare.

In case of chir pine the study reveals that this crop is totally absent in the Kashmir province and further that in Jammu province too it is extremely unevenly distributed. This is supported by the fact that 43.31 per cent of the total area under this crop lies in the
Rajouri and the Poonch divisions. Another 42.46 per cent area under this crop lies in the Billawar, the Udhampur and the Reasi forest divisions. The Himalayan chir pine exists insignificantly on the lower reaches of Bhaderwah and the Doda forest divisions while it exists more or less comfortably over the areas of Ramban forest division. The study brings out that although more than 43 per cent of the area lies in the Rajouri and the Poonch forest divisions, these divisions contain only 21.99 per cent of the total population while the Billawar forest division which possesses only 14.91 per cent of the areas under this crop accommodates 41.40 per cent of the total population thereby showing the highest density per hectare. The Reasi forest division, which accommodates 23.54 per cent of the population, shows the second highest density per hectare with 32 trees. The Rajouri and the Poonch forest divisions, possessing maximum areas under the crop accommodate the least number of trees per hectare.

If there is no natural regeneration, the forests would vanish in due course of time. The present study reveals that as a result of forest conservancy measures introduced in Jammu and Kashmir State during the last century, the kail crop has got the maximum benefit. This has largely been due to certain natural advantages that kail enjoys. These include the production of seed every
year which is light and gets dispersed over greater
distances easily besides being fertile and very viable one.
It has been observed that kail regenerates fairly well in
its natural habitat zone without any difficulty. The
condition of deodar regeneration is much the same as in
the case of kail but it will not be out of place to mention
certain measures which need to be taken in order to
facilitate the natural regeneration in deodar - kail zone.
These include, as the study reveals, the urgent necessity
of closing the forested areas for grazing inspite of the
fact that it would involve serious socio-political problems
Silvicultural operations such as removal of felling refuse
and cleaning and thinning of deodar forests should get due
consideration and attention of the managers of these
forests. Artificial regeneration is suggested in these
areas which show deficient natural regeneration. It has
been observed that little effort is being made to get these
forests regenerated which is a negative aspect of scientific
management of the forests. Further, it has been found that
advance growth particularly in deodar forests, is not being
cleared of late due to certain policy matters but the policy
makers must first see the larger interest of forestry in
general and the people of the state in particular rather
than narrow political considerations. It is, therefore,
suggested that the forest management should avoid political considerations while taking scientific decisions.

In the fir forests, as has been brought forth by the present study, biological and physical balances of the soil have been altered on nearly 10 per cent of the area under this species due to continuous grazing for many decades. On about 70 per cent of the areas under fir, routine regeneration measures would be sufficient for achieving the desired results if grazing is controlled. On the whole it will be worthwhile to take special silvicultural measures such as cutting back of shrubs, burning in the wet areas and intensive soil working in overgrazed and trampled areas. In the absence of these measures, natural regeneration of fir, at present, is far from satisfactory and, therefore, needs to be supplemented by artificial regeneration. Sincere efforts on the part of managers of these forests are, therefore, needed. These efforts include the collection of seed every year in general and during good seed years in particular. Establishment of nurseries at proper places and plantation of seedlings should be preceded by elimination of felling refuse and unwanted undergrowth. A total ban on grazing in these new plantations should be strictly enforced. Thus nature should be helped to get these forests properly regenerated otherwise
it will be difficult to meet the ever increasing demand of fir timber.

Due to frequent seeding coupled with high seed fertility chir pine in its natural habitat regenerates easily. This has been clearly brought out by this study. Soil erosion in these forests is a serious problem which needs immediate attention. It has further been established that if forest fires, which are a serious inhibiting factor in natural regeneration in chir forests, soil erosion and overgrazing in these forests are taken care of chir regeneration will be satisfactory all over its natural habitat in Jammu and Kashmir State.

It has further been concluded that conditions of natural regeneration in the scrub and degraded forests of outer hills in general and bamboo forests in particular are in a pretty bad shape. A comprehensive plan to get them artificially regenerated will be quite viable from the economic point of view. Regeneration and reestablishment of *Acacia catechu*, *Acacia modesta* and *Dalbergia sissoo* will not only rehabilitate the degraded forests but also improve the standard of living of the people surrounding these areas who will get employment opportunities in the process of artificial regeneration. The people will also reap the collective benefits from the exploitation of these forests in the long run besides conserving their natural environment.
The bamboo forests, for instance, which used to occupy the entire belt of outer hills and plains have now been restricted to the Jasrota range of the Billawar forest division. If grazing and other forms of biotic interference is checked along with measures to regenerate them artificially this whole belt can again bear a luxuriant growth of these forests. Once this objective is achieved many bamboo based industries can be established. Important among them include the paper and pulp industry which can entirely depend on these forests for sufficient and consistent supplies. Many small scale industries, drawing their raw material from bamboo forests can also be established. These include the bamboo furniture industry, the baskets and packing cases industry and many industries making decorative articles from the bamboo. Similarly the regeneration and rehabilitation of *Acacias* in this region may give rise to the *Katha* making industry. Thus if a master plan on these lines is envisaged and properly executed, the whole *Kandi* belt can be transformed into an industrial belt of great importance. This will go a long way in removing the deep rooted poverty in this region.

After carefully analysing the actual extraction for the last decade certain projections for the level of future extractions have been made. It has been found that the approximate expected extraction of *Deodar* in 1985-86
would come to 131.63 thousand cu.m. whereas for kail the figure stands at 101.03 thousand cu.m. for the year 1985-86. Similarly projected extraction for fir stands at 176.47 thousand cu.m. for the year 1985-86. In the case of chir extraction 92.72 thousand cu.m. of timber may be expected in the same year. Although all these projections are purely hypothetical in nature, they are certainly indicative of a trend. Further from the assessment of the growing stock of various coniferous species it has come to light that except for fir, the position of all the species seems to be satisfactory. The fir forests, which occupy about 38 per cent of the total areas under the four coniferous species are being rapidly depleted. This is largely due to misuse and mismanagement of these forests. Managers of these forests, therefore, should take necessary steps to remove this negative trend by plugging the loopholes. This becomes even more important when we consider the fact that the misused and mismanaged volume of fir timber during the decade is four times the actual volume extracted.

Forest based industries do not enjoy that position in the economy of the state which is expected of them, this in short can be the logical conclusion. It has been found that baring the Rosin and turpentine factory and The Government Joinery Mills, there is no healthy forest
based industry— if at all there are any. The Kashmir willows— a cricket bat manufacturing unit in public sector and the Government Match factory are not giving the expected results. These two concerns have the potential to revolutionise the production of superior quality products if proper attention is paid to them. All the geographical pre-requisites are there for further improvement and development of both these industries. The only thing needed is the necessary will and action. The condition of the santonin industry, which enjoys a monopoly in the country, seems satisfactory but still the production of santonin can be increased by laying down proper working plans for the areas which produce artimesia, the main raw material for this industry. Besides these industries many more forest based industries, both in the small scale as well as in the large scale sector, can be established. The paper and pulp industry is the glaring example which is long over due in the state. The present study will make the work of the planners of this industry easier by giving a clear picture about the forest resources of the state. Further, timber waste such as saw dust, and parts of timber and left over timber in the forests can sustain many industries, particularly the manufacture of deodar oil. Many other industries based on minor forest products can also successfully be established in the state. It will not be out of place to mention few
such industries here. It has been established by this study that Jammu and Kashmir forests are rich in vegetable tanning material which can supply raw material for many tanning units. Medicinal plants have come out to be the most important minor forest products of the state. If these are properly worked and managed scientifically they can provide sustained supply of raw materials to many more industries which can substitute synthetic drugs to some extent. Hardboard manufacturing units drawing their raw material from the fibre of pine needles, can also be established in various parts of the state. For this industry there will be no dearth of raw material.

Although a great potential for the development of minor forest products exist in the state they have not been properly surveyed so far. A careful survey of minor forest products is, therefore, an urgent need. These minor forest products get almost no attention from the working plan officers. In view of their importance, both economic and ecological, it is suggested that a separate working plan cell for the minor forest products may be created in the forest department to assess these resources and manage them on scientific lines. It has been brought forth by the study that these resources are slowly but surely depleting. Their conservation and regeneration should, therefore, get top priority before it is too late. Some important medicinal
plants, such as **Dioscorea**, **Heracleum**, **Belladona**, **Artimisia** and **kuth**, are indigenous to the state. Their cultivation at present is not being allowed in the private sector. This situation needs careful consideration and if it is found that the public sector is unable to cultivate them on larger scale then there seems to be no harm in allowing private enterprise to take up the cultivation of these plants under the supervision of forest department. Economically this will be a very wisestep.