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### Threat Status of *Saussurea lappa*-a study in Bhaderwah area of Jammu & Kashmir India.

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#### ABSTRACT: -

*Saussurea lappa* being one of the most sought-after species in the pharmaceutical industry, providing good dividends to the States//UTs from where it is procured, is rapidly declining in nature. The threat perception of the species changes every single day. This highly beneficial herb, is under immense pressure to survive in natural habitat. The threat status of *Saussurea lappa* has increased manifold from last 15 years. The present study entitled as “Threat status of *Saussurea lappa* -a study in Bhaderwah area of Jammu & Kashmir India, was conducted at Bhaderwah, District Doda a High-Altitude area where the species has a natural agro-climatic condition to thrive. A comprehensive protocol was framed. From this study it was concluded that Illegal/Unsustainable extraction from the Forests is a major cause for dwindling species of *Saussurea lappa*. Lack of understanding of sustainable harvesting/extraction has led to disturbance of habitat, loss of diversity, reduced abundance and local declining of *Saussurea lappa*.

**Key words:** *Saussurea lappa*, Bhaderwah, Threatened herbs



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## INTRODUCTION

The Union Territory of Jammu & Kashmir is rich storehouse of medicinal, aromatic and other economic plants due to the wide variation of temperature (-20°C to 45°C) and altitudes (300 to 8,600 meter above the sea level) found throughout the UT. The Himalayas known for its loftiest and longest mountain ranges in the world is a reputed treasure of Medicinal Plants. More than 50% of plant species described in British pharmacopoeia are reported to grow in Jammu & Kashmir. Near 570 plant species are reported to be of medicinal importance<sup>1</sup>. In India *Saussurea lappa* is recorded as naturally growing in the Suru Valley, Kishenganga and the upper reaches of Chenab Valley<sup>2</sup>. Chenab valley being a remote region in Himalaya, ranges from Banihal on one side and Marwah on the other side and consists of three Districts viz Doda, Ramban and Kishtwar. Bhaderwah (area of study) is situated to the south of main Doda town and is a temperate area resembling Kashmir valley. Medicinal plants in Chenab valley are used heavily by local communities for traditional healthcare as well as trading. Further, intensive grazing by a large livestock adds additional pressure on the medicinal plants in different regions. In addition, seasonal migration of nomads and trans-human pastoral communities occupies most of the pristine forests and alpine meadows during summers resulting in high level of impact on the local biodiversity including medicinal plants. Some important Medicinal Plants like *Picrorhiza kurroa*, *Rheum emodi*, *Innula racemosa*, *Saussurea lappa* (*costus*), *Saussurea sacra*, *Artemisia* (*spp*), *Pyrethrum* (*Spp*), etc form natural habitat of Bhaderwah Forest range. The medicinal extracts and essential oils derived from these plants form the backbone of pharmaceutical, perfumery and cosmetic industry<sup>3</sup>

*Saussurea lappa* Clarke (Compositae),

commonly known as *Kushta* in Sanskrit, is a tall robust perennial herb distributed in Jammu & Kashmir. The hot water extract of the roots has been traditionally used for inflammations and rheumatism (Shah, 1982; Sircar, 1984; Lechner-Knecht, 1982). The dried root of *Saussurea lappa* has been traditionally used for abdominal pain and tenesmus as a traditional medicine in Korea, China and Japan (Robles et al., 1995)<sup>4</sup>.

*Saussurea lappa*<sup>5</sup>

**Botanical Name(s)** *Saussurea lappa*

Higher classification: Costus

Order: Asterales

Tribe: Cynareae

Rank: Species

Family: Asteraceae

*Saussurea lappa* Clarke (Compositae) generally called as costus or kuth root in English and have different vernacular names such as Kustha (Sanskrit), Kust (Arab and Persian), Kut, Kur, Pachak (Hindi and Bengali), Kostum, Putchuk, Gostham (Tamil), Upaletta, Kur (Gujarati), Kot, kust (Punjabi), Changala (Telugu), Sepuddy (Malayalam), Kostha (Kannada), Kuth, Postkhai (Kashmiri) and the trade name is Kuth<sup>6</sup>. The plant is widely distributed wild in India at an altitude of 2,500 to 3,000 m among the regions of Himalayas, Jammu & Kashmir, Western Ghats and Uttarakhand, Himachal Pradesh, Jammu & Kashmir to meet the commercial demand of the market due to over exploitation of the wild<sup>7</sup>. The plant is ancient, well-known about 2,500 years ago and used traditionally in the Indian systems of medicine such as Ayurveda, Unani, Siddha etc.

*Saussurea lappa* (SL) is an upright, robust, tall, perennial herb growing to a height of 1–2 m having the stem erect. Root is stout of about 60 cm having a strong, characteristic odour. The transverse section clearly shows periderm in which phloem and xylem are

distinctly shown. Stem is also stout and fibrous. The leaves are lobate, stalked and are about 1 m long. Flowers are dark bluish purple to black coloured arranged in axillary and in terminal clusters. The flower heads are stalkless, hard and round in shape about 3–5 cm in diameter. Fruit is about 3 mm long, curved, cupped and compressed (Wealth of India 1985). Mostly the essential root oil and root are used for the medicinal purposes especially in Siddha & Unani. The dried root which tastes slightly bitter is dirty grey to yellow in colour externally and about 8–12 cm long, 1–3 cm in diameter. It is generally wrinkled, ridged and the secondary roots are more or less cylindrical. The cut open section of the root shows two regions light thinner outer ring and dark brown inner portion. The root is having a strong characteristic aromatic odour (Indian Pharmacopeia 2002). In the southern part of Kashmir, Himalaya and Punjab regions the roots and root stalks are used for toothache, asthma, dysentery, skin diseases, rheumatism and as incense<sup>8</sup>.

In Ayurveda system of medicine the root is used particularly for improving complexion, cures leucoderma, itching, ringworm, vomiting, scabies, head-ache, epilepsy, hysteria and even “tridosha”, diseases of the blood<sup>9</sup>. In Unani system of medicine it is used drug of choice in asthma, liver diseases, disorders of brain and nervous system, immune-modulator, cough, fever, inflammation<sup>10</sup>. Various therapeutic potentials have been attributed to SL roots in the traditional system of medicine as well as in folklore practices. The personal observations and interrogation is very important to know about the knowledge of tribal people about plants around them. The assistance of reliable old people and herbalists (Hakims) of the particular area is taken in collection of information about parts of the plant of medicinal value, mode of administration, dosages etc<sup>11</sup>. Several bioactive phyto-

constituents have been isolated and pharmacological activities of the plant have been reported over the years. Biologically active compounds in this plant is Lactone, Cynarpicrin, Dehydrocostus, germacrene and lappadilactone<sup>12</sup>.

### Status of Availability

The plant over the past several decades has been extensively exploited through extraction of crude drug and also through impact of various anthropogenic pressures like grazing, uncontrolled deforestation, selective extraction, rapid urbanization and industrialization. Now the situation is such that a single plant of *Saussurea lappa* is seen after hours of trekking in higher regions of Himalaya<sup>13</sup>.

*Saussurea lappa* is a threatened Medicinal Plant listed in Convention of International Trade in Endangered species of Wild Fauna and Flora (CITES 2014) and critically endangered on the IUCN red list<sup>14</sup>. There is a strong need of alpine gardens to be established in the high Altitude regions of J&K so as to conserve and multiply these endangered plant species<sup>11</sup>. The supply base of ninety percent herbal raw drugs used in the manufacture of Ayurveda, Siddha, & Unani systems of medicine is mainly from the forests. The wild source is sinking day by day. Cultivation is clearly a sustainable alternative to the present collection of medicinal plants from the wild.<sup>15</sup>

### OBJECTIVES

- To study the status of *Saussurea lappa* availability in the designated areas of Bhaderwah area of Doda District in J&K.
- To compare the current availability of the species with the availability before a decade or more.

- To evaluate the causes of current threat status of *Saussurea lappa* species in Natural habitat of J&K.

## METHODOLOGY

The present study entitled as “Threat status of *Saussurea lappa* study in Bhaderwah area of Jammu & Kashmir India” was conducted in Bhaderwah Forest Range of Doda District. A comprehensive protocol was framed. The study extended from August 2020 to November 2020. Blue print of the study was conceptualized as materials and methods which can be described as under

**Study design:** Pharmacognosial Study.

**Area of Study:** Data was collected from Forest Department, SKUAST –K, IIIM J&K. Out of total two areas were selected Viz a viz upper

reaches of Bhaderwah from Thantera to Thanala (10 Sq Kms) falling under upper Bhaderwah Forest Range and Neeru Forest Range (10 Sq kms) falling under Manasbal Forest range.

Data was procured through:

1. Visits of PI to the area of study. (Annexure “A”)
2. Interviews and interactions with Locals/Nomads (in the age group of 40-75 Years) through questionnaire. (Annexure “B”)
3. Feedback from officials of Forest Department through questionnaire. (Annexure “C”)
4. Feedback from Scientists/Research scholars of SKUAST-K, IIIM J&K, J&K SFRI, J&K SMPB working in Medicinal Plants sector through questionnaire (Annexure “D”)
5. Forest Department.
6. Bhaderwah Development Authority

## OBSERVATIONS

### A. Visits of PI to the area of study

**Target 200 Plants of *Saussurea lappa* in 10 Sq km area (Natural habitat) each of two areas of study**

% age of area under Forest Department	70	14/200
% age of area under wildlife Department	30	6/200
% age of area having natural habitat for <i>Saussurea lappa</i>	100	20/200
% age of plants found by PI in the Area of study	6	13/200
% age of plants found by PI in the Area of study	7	15/200
% age of target achieved	7	28/400

## B. Interview and interactions with Locals/Nomads (in the age group of 40-75 Years)through questionnaire.

Sample size: 64 people (32 at each place)

% age of people who know <i>Saussurea lappa</i> is found in the area of study	100	64/64
%age of people using <i>Saussurea lappa</i> as traditional Medicine	79	51/64
% age of who think availability of <i>Saussurea lappa</i> species have dwindled since last decade.	100	64/64
% age of who think Illegal extraction from forests is the cause of dwindling availability of the species.	76	49/64
% age of who think lack of conservation and cultivation of <i>Saussurea lappa</i> is the cause for declining availability of the species.	17	11/64
% age of who think Environmental factors are responsible for declining availability of the species	6	4/64

### Data procured from Research Institutes

## C. Feedback from Scientists/Research scholars of SKUAST-K, IIM J&K, J&K SFRI, working in Medicinal Plants sector through questionnaire

Sample size: 7 scholars

% age of Scholars giving <i>Saussurea lappa</i> as status of High demand species	100	7/7
%age of scholars who think that the species of <i>Saussurea lappa</i> is dwindling in J&K.	100	7/7
% age of scholars who think Illegal extraction from forests is the cause of dwindling availability of the species.	100	7/7
% age of Scholars who think lack of conservation and cultivation of <i>Saussurea lappa</i> is the cause for declining availability of the species.	71	5/7
% age of Scholars who think Environmental factors are responsible for declining availability of the species	28	2/7
% age of Scholars who think Current status of threatened species be changed to Endangered species for <i>Saussurea lappa</i> .	100	7/7

## Data Procured from Forest Department

### D. Feedback from Officers/ officials of Forest Department through questionnaire.

#### Sample size 9 officers

% age of officers/officials who think <i>Saussurea lappa</i> is a High demand species	88	8/9
%age of officers/officials who think that the species of <i>Saussurea lappa</i> is dwindling in J&K.	100	9/9
% age of officers/officials who think Illegal extraction from forests is the cause of dwindling availability of the species.	22	2/9
% age of officers/officials who think lack of conservation and cultivation of <i>Saussurea lappa</i> is the cause for declining availability of the species.	55	5/9
% age of officers/officials who think Environmental factors are responsible for declining availability of the species	11	1/9
% age of officers/officials who think Current status of Threatened species be changed to Endangered species for <i>Saussurea lappa</i> .	100	9/9

## DISCUSSION

This observational study was meant to assess the threat status of *Saussurea lappa* through the methodology mentioned above, although based on the questionnaire and other observations like the traditional knowledge about the usage of herbs in the area of study by locals/nomads were also inferred. *Saussurea lappa* owing to its immense medical value, has got a high demand in pharmaceutical industry. Despite providing good dividends to the States/UTs from where it is procured, it is rapidly declining in nature and is under immense pressure to survive in natural habitat. Three major causes found by the PI during the study for its decline are:

**Illegal extraction**, the major cause found by the PI during the study, for which almost 75% people, 100% Research Scholars, and even 22% Forest department officials (owing to their official constraints) viewed to be one of the major causes for its dwindling species. The illegal extraction of high commercial and high

demand species goes unabated in J&K. The Forest Department and the Law enforcement agencies have done a lot to stop the illegal extractions, but owing to the difficult terrains and lack of manpower, it is not possible to keep a complete check on all the areas. Although there is Kuth Act 1979 already enforced in J&K which envisages complete blanket ban on extraction of Medicinal Plants especially *Saussurea lappa*. This has lead to an alarming statistics of the availability of the species in nature.

**Lack of Conservation & Cultivation** of the species was the 2<sup>nd</sup> important cause found for its decline. Project of “Conservation & Development of Medicinal Plants” was sanctioned to Forest Department by Ministry of AYUSH, Govt of India and Rs 434 Lakh were released for the purpose. 1700 Hectares of Forest land were taken up by the Forest Department under in-situ and Ex-situ Conservation of Medicinal Plants under the project in J&K. The UT of J&K needs more and more areas under Conservation of this endangered species and new areas need to be

identified for conservation purposes.

**Commercial cultivation** of Medicinal Plants is the major challenge to boost the economy, generate employment, lay foundations for the development of the industry, and overall to save the endangered, rare and threatened medicinal Plants to become extinct in their natural habitats. To fulfill the above objective the Centrally Sponsored scheme of National Mission on Medicinal Plants was launched in J&K during 2009-10, and State Horticulture Mission was designated as Nodal agency for implementing the Scheme in the Erstwhile J&K State. Few farmers have been benefitted from the scheme. Few nurseries have been established during last 4 Years, with negligible results of providing Quality Planting Material (QPM) to the Farmers. Only Directorate of Floriculture Kashmir established a Hi-tech Nursery and two poly houses besides maintaining the already established Herbal garden at Botanical garden Srinagar. This was made possible by active collaboration and technical assistance by Directorate of ISM. Marketing is the most important component for successful establishment of Medicinal plants sector as an Industry. But four years since the establishment of Mission no marketing infrastructure has been put into place in the UT of J&K and as such potential growers are discouraged to take this field as a business venture. No public or private sector processing unit has been established by the implementing agency from last four years in J&K. A ray of hope has risen by initiation of Establishment of Institute of High Altitude Medicinal Plants at Baderwah wherein a complete package for the farmers, growers, traders, entrepreneurs, scholars, scientist, and all stakeholders of medicinal plants sector will be provided under one roof. Work on District Marketing Mandi, and Post Harvest management units is already going on in the premises of the Institute, and a Model Nursery with Seed Germplasm Centre is

envisaged to be setup by March 2020, thus providing all the facilities at one place to the stakeholders of Medicinal Plants sector.

**Environmental factors** were found to be another cause for the decline of species. The causes varied between, Global warming, dwindling forest areas, more human interference, Soil erosions etc. Increased population has taken its toll on the environment, whether it is wildlife or botanical life. The species which once flourished in their natural habitats have become vulnerable due to more and more human interference. Felling of trees to create more agricultural lands, to the environmental pollution set up by using modern agricultural methods, vehicular transmissions etc have all contributed in making the species vulnerable and fit for extinction.<sup>16</sup>

**Lack of awareness** among the masses about the importance of the species, its conservation, cultivation and commercial utilization was also found to be one of the causes. The awareness programmes need to focus on the the local population in and around the natural habitats of the species.

The species of *Saussurea lappa* is suffering from one or combination of more than one of the above factors. The threat status has rapidly increased from the last decade. The species which were put under “Red list” of IUCN are emerging to be an “Critically Endangered” in J&K. Before 15 years people used to find more than 250 plants in the area of study, and now the status is that 15-18 Plants are found in the study area. If the conditions remain the same the species may suffer extinction in J&K Forests.

**From the study conducted by PI, and data analyzed, following observations have been inferred:**

- The threat status of *Saussurea lappa* has increased manifold since last 15 years.

- Illegal/Unsustainable extraction from the Forests is a major cause for dwindling species of *Saussurea lappa*. Lack of understanding of sustainable harvesting/extraction has led to disturbance of habitat, loss of diversity, reduced abundance and local declining of *Saussurea lappa*.
- Negligible Commercial Cultivation of species through Farmers/Growers/NGOs/Public sector that in turn has put tremendous pressure on the natural reserves of *Saussurea lappa*.
- Few Conservation areas for a *Saussurea lappa* in its natural habitat.
- Lack of awareness among general masses about the importance of sustaining this important species.

## CONCLUSION:

Medicinal Plants are natural resources, formulating a backbone for AYUSH industry and management of diseases, which is achieving enormous popularity among the masses, more in developed countries for its preventive and curative efficacies more so for life style disorders. The need of the hour is to promote, and propagate this natural wealth, with innovations for their sustainability in their natural diversities, as well as development of Agro techniques to swell their populations in unfamiliar habitats. *Saussurea lappa* is not the only species suffering, the study may hold true for other important Cis-Himalayan species of Medicinal Plants of Jammu & Kashmir. Research Institutes, Forest Department, Medicinal Plants Board etc, all have obligations to save these species for future generations to come. To fill the huge demand of the herbal industry commercialization and privatization of important components like Marketing, & processing should be a priority. Likewise, Research Institutes like SKUAST-J/K, IIM J&K, Universities, should prioritize to develop good agro-techniques and QPM for *Saussurea*

*lappa* and other endangered species, so that the farmers/growers may find it feasible to cultivate these species and add these species to their cash crops. Moreover, UT Govt. should initiate steps at administrative level for encouraging entrepreneurship in Medicinal Plants Sector, and ensuring policy framework regulating the trade, cultivation, and value addition in the sector. The sector has the potential to lead the employment/revenue generation for the UT of J&K after power generation.

## Recommendations:

### Short term

1. The species should be prioritized for conservation and cultivation in J&K and the trade of cultivated Kuth to be allowed without hindrance.
2. New cultivation zones for sustainable cultivation of the species be identified by Medicinal Plants Board and other line Departments.
3. Capacity building programs for farmers to be organized by Directorate of ISM and Medicinal Plants Board for technical aspects of developed agro-techniques for cultivation of *Saussurea lappa*.

### Long term:

1. New areas for conservation of *Saussurea lappa* be identified and projects to be implemented on public, private partnerships.
2. Measures to be taken for sustainable extraction/harvesting of the species from the Forests.
3. Strict laws are needed to curb the illegal extraction of the species.
4. Quality germplasm of the species be generated through reputed research Institutes for which National Medicinal Plants Board, Ministry of AYUSH, Government of India should provide special R&D projects to these Institutes.
5. Institute of High Altitude Medicinal Plants being set up at Baderwah should focus on

establishing a gene pool, propagation (seeds, vegetative parts, in vitro), multiplication, ex-situ conservation, development of natural interpretation site and large scale planting materials to minimize the scarcity of planting materials of sensitive plant species and generation of base line data on climatic change and global warming within for the purposes of scientific studies, cultivation and product development.

6. Mass awareness programmes should be taken by Line departments including Directorate of ISM,J&K.

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## ANNEXURE "A"

**Check list for Pi's visit to Bhaderwah Forest Range)  
(Higher reaches of Bhaderwah )**

1. What is the nature of the area?       FOREST    WILDLIFE    HABITATED    PRIVATE
  2. Whether the area is Natural Habitat of Temperate Medicinal Plants?       YES    NO
  3. Whether the area is currently under Forest conservation Scheme of Medicinal Plants?  
 YES    NO
  4. Whether the area is a natural habitat of *Saussurea lappa*?       YES    NO
  5. On an average how many plants of *Saussurea lappa* did you find?  
 LESS THAN 50    50-100    100-200    200-500    MORE THAN 500
  6. What do you think is the major factor for dwindling number of species in the area?  
 ILLEGAL EXTRACTION       LACK OF CONSERVATION SCHEMES  
 ENVIRONMENTAL FACTORS       OTHERS  
If others please elaborate
- 
7. Whether the herb is used for its Medicinal Properties by the locals/Nomads?  YES    NO
  8. What is officially the current status of the species?       ABUNDANT    VULNERABLE    THREATENED    RARE    ENDANGERED
  9. What do you think should be current status of the species?       ABUNDANT  
 VULNERABLE    THREATENED    RARE    ENDANGERED
  10. What do you think should be the important step to save this species?  
 MORE CONSERVATION AREAS    MASS CULTIVATION    MASS AWARENESS    SCIENTIFIC INNOVATIONS    ALL THE ABOVE STEPS.

## ANNEXURE "B"

## Questionnaire for Locals/Nomads in and around the Study Area

1. For how many years you have been in and around the area ?  LESS THAN 1YEAR  1-5 YEARS  5-10 YEARS  10-15 YEARS  MORE THAN 15 YEARS
2. Is *Saussurea lappa* (Kuth) present in the area?  YES  NO
4. Whether the area is a natural habitat of *Saussurea lappa*?  YES  NO
5. On an average how many plants of *Saussurea lappa* you used to find before 15 or more years?  
 LESS THAN 100  100-200  300-500  500-1000  MORE THAN 1000
6. On an average how many plants of *Saussurea lappa* did you find currently in the study area?  
 LESS THAN 50  50-100  100-200  200-500  MORE THAN 500
7. What do you think is the major factor for dwindling number of species in the area?  
 ILLEGAL EXTRACTION  LACK OF CONSERVATION SCHEMES  
 ENVIRONMENTAL FACTORS  OTHERS

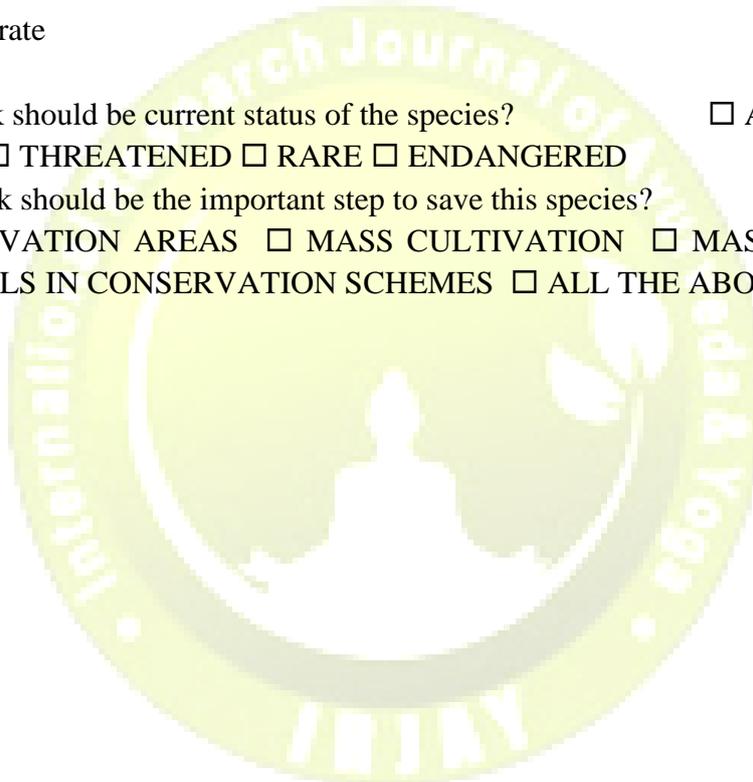
If others please elaborate

7. For which purpose you use the herb?  MEDICINAL  CATTLE FEED  VEGETABLE  
 OTHERS
8. For which Medicinal Property you use the Herb?  DIABETIES  WOUNDS/ULCERS  INFLAMMATION  PURGATIVE/LAXATIVE  ALL
9. What do you think should be current status of the species?  ABUNDANT  
 VULNERABLE  THREATENED  RARE  ENDANGERED
10. What do you think should be the important step to save this species?  
 MORE CONSERVATION AREAS  MASS CULTIVATION  MASS AWARENESS  INVOLVING LOCALS IN CONSERVATION SCHEMES  ALL THE ABOVE STEPS.

## ANNEXURE “C”

## Questionnaire for Forest officials/Wild life officials Posted in the area.

1. For how many years you have been posted in the area ?       LESS THAN 1YEAR  
 1-5 YEARS    5-10 YEARS
2. Is *Saussurea lappa* (Kuth) present in the area?       YES    NO
4. Whether the area is a natural habitat of *Saussurea lappa*?       YES    NO
5. 6. On an average how many plants of *Saussurea lappa* did you find currently in the study area?  
 LESS THAN 100    100-200    300-500    500-1000    MORE THAN 1000
6. Do you think the species of *Saussurea lappa* is dwindling in nature?    YES    NO
7. What do you think is the major factor for dwindling number of species in the area?  
 ILLEGAL EXTRACTION       LACK OF CONSERVATION SCHEMES  
 ENVIRONMENTAL FACTORS       OTHERS
- If others please elaborate
9. What do you think should be current status of the species?       ABUNDANT  
 VULNERABLE    THREATENED    RARE    ENDANGERED
10. What do you think should be the important step to save this species?  
 MORE CONSERVATION AREAS    MASS CULTIVATION    MASS AWARENESS     
 INVOLVING LOCALS IN CONSERVATION SCHEMES    ALL THE ABOVE STEPS.



## ANNEXURE "D"

## Questionnaire for Scientists/Research Scholars/officers of Medicinal Plants Sector (IIIM J&amp;K, J&amp;K SFRI, J&amp;K SMPB, SKUAST-K)

1. For how many years you are in Research work in Medicinal Plants Sector ?  LESS THAN 1 YEAR  1-5 YEARS  5-10 YEARS
2. Have you ever worked on *Saussurea lappa*?  YES  NO
4. Whether the study area of PI is a natural habitat of *Saussurea lappa*?  YES  NO
3. What is the demand of *Saussurea lappa* in the market?  POOR  AVERAGE  GOOD  HIGH
6. Do you think the species of *Saussurea lappa* is dwindling in nature?  YES  NO
7. What do you think is the major factor for dwindling number of species in the area?  
 ILLEGAL EXTRACTION  LACK OF CONSERVATION SCHEMES  
 ENVIRONMENTAL FACTORS  OTHERS

If others please elaborate

7. For which Medicinal Property the herb is used currently?  DIABETIES  WOUNDS/ULCERS  INFLAMMATION  GASTRIC PROBLEMS  ALL
9. What do you think should be current status of the species?  ABUNDANT  VULNERABLE  THREATENED  RARE  ENDANGERED
10. What do you think should be the important step to save this species?  
 MORE CONSERVATION AREAS  MASS CULTIVATION  MASS AWARENESS  INVOLVING LOCALS IN CONSERVATION SCHEMES  ALL THE ABOVE STEPS.