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Nikhil Rawat
Department of Botany, Soban
Singh Jeena Campus, Almora,
Kumaun University Nanital,
Uttarakhand, India

Manju Lata Upadhaya
Department of Botany, Soban
Singh Jeena Campus, Almora,
Kumaun University Nanital,
Uttarakhand, India

Diversity of the medicinal plants of Almora district, Uttarakhand and their Ethno-medicinal use

Nikhil Rawat and Manju Lata Upadhaya

Abstract

The present study mainly focus on the identification, documentation and conservation of ethno-medicinal plants traditionally used for treating various ailments and diseases by the local villagers of Almora District of Uttarakhand. A total of 50 different species of trees and shrubs have been identified belonging to 28 families and 43 genera with the most dominant family Rosaceae followed by Moraceae used in the treatment of 25 diseases and ailments.

Keywords: Biodiversity, Almora, identification, documentation, ethano-medicine

1. Introduction

The Himalayan Alpine region is rich in the diversity of medicinal plants due to its rich phyto-geography and climatic conditions (Kumar *et al.* 2020). Plant plays a vital role in our day to day life and plays a crucial role in the development of modern health care system. The foundations of typical traditional systems of medicine for thousands of years that have been in existence have formed from plants. The plants remain to offer mankind with new medicines. The traditional medicine practice is widespread in China, India, Japan, Pakistan, Sri Lanka and Thailand. About 40% of the total medicinal consumption is attributed to traditional tribal medicines alone by China. It is estimated that in mid-90s, more than US\$2.5 billion have resulted from the sales of herbal medicines. The herbal medicinal preparations are more in demand than mainstream pharmaceutical products in Japan (Ahmad Dar *et al.* 2017). The traditional healing system is not restricted in India. As per WHO 80 percent peoples of developing countries and 70 percent peoples of developed countries use some form of alternative medicines. The use of herbal medicine as one element of alternative medicine is increasing worldwide (Welz *et al.* 2018) [17]. Even today, plants are not only indispensable in healthcare, but form the best hope of source for safe future medicines. (Hamburger and Hostettmann, 1991) [4]. Most of the important drugs of the past 50 years, which have revolutionized modern medicinal practice, have been isolated from plants. These chemical ingredients exhibit therapeutic properties of plant and animal drugs (Ahmad Dar *et al.* 2017). The WHO endorses and promotes the addition of herbal drugs in national health care programs because they are easily accessible at a price within the reach of a common man and are time tested and thus considered to be much safer than the modern synthetic drugs (Singh and Singh, 1981) [16].

The Indian system of medicine has been a part of the culture and tradition of India down the centuries. The Sushruta Samhita attributed to Sushruta in the 6th century BC describes 700 medicinal plants. The Indian Himalayan region (IHR), a mega biodiversity hotspot comprises of about 18,440 species of plants and 1748 taxa were recorded to be of medicinal value (Samant *et al.*, 1998).

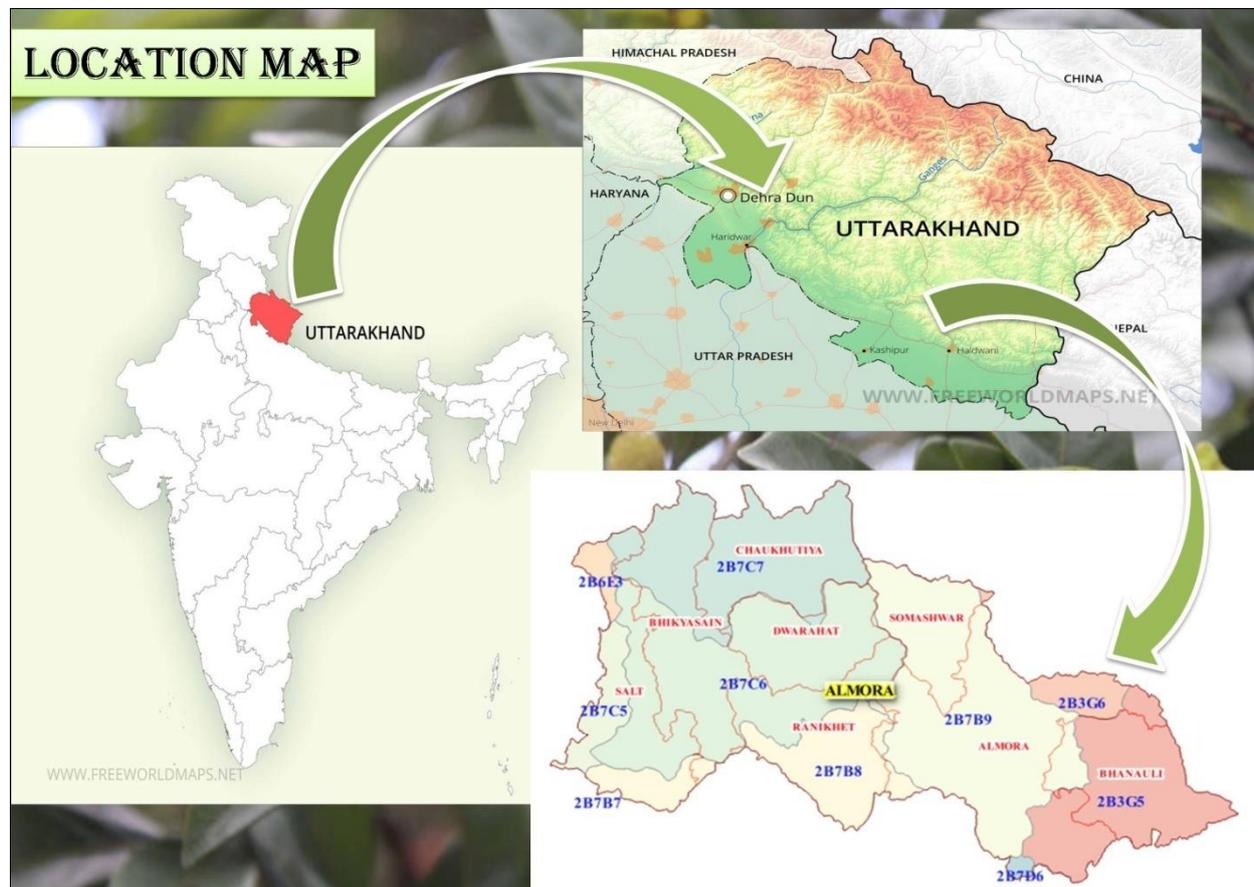
The knowledge possessed by the traditional healers (Vadhaya) can be used for the development of modern medicines. Modern searches for bioactive molecules typically make use of plants used by traditional healers. This has led to the isolation of several new therapeutically important compounds. A good number of potent drugs and a large number of therapeutic leads and many new pharmacologically active constituents have been developed from herbal drugs due to the dedicated efforts of researchers (Philipson, 1990) [12]. Due to the lack of proper healthcare system peoples of the region are still dependent upon this traditional healing system and also use these methods to treat their domesticated animals.

Corresponding Author:
Nikhil Rawat
Department of Botany, Soban
Singh Jeena Campus, Almora,
Kumaun University Nanital,
Uttarakhand, India

2. Study Area

The Almora district lies between 29°30'N to 30°20'N latitudes and 79°20'E to 80°20'E longitudes. It is located in the central part of kumaun region of Uttarakhand (India). The study area covers the plants of Almora locality (Almora and Jageshwar). Almora have annual temperature ranging from -3 to 28°C (27-82°F). The region has remarkable diversity in the natural

vegetation. Flora of this region is classified into tropical, Himalayan, sub-tropical, sub-alpine and alpine vegetation. Alpine and sub-alpine zones are considered as the most natural abode of the largest number of medicinal plants with many dominant species such as Sal, Haldu, Bamboo, Blue Pine, Deodar, Silver Fir.



3. Methodology

The present study based on a field survey in Almora district to identify the medicinal plants diversity of the region. The plants are collected from Almora and Jageshwar. The plants were dried by using newspaper and a herbarium is prepared. The plants were identified and their medicinal values were documented by the information obtained by the local people and traditional healers taking their traditional knowledge into consideration and with the help of various research papers (Kumari *et al.* 2011, Gangwar *et al.* 2010, Sharma 2015, Kumar *et al.* 2010, Joshi *et al.* 2014) ^[11, 3, 2] and through

internet sources (Flowers of net.org, pfa.org, ncbi, Wikipedia, flowers of India.net, Indian biodiversity.org).

4. Result and Discussion

In this present study a total of 50 medicinal shrubs and trees belonging to 43 genera and 28 families have been identified and documented (Plate 1-9) which are traditionally used for treatment of diseases and ailments in the Almora District of Uttarakhand (Table 1). A total of 34 trees and 16 shrubs species have been recorded comprising 68% and 32% of the total recorded species (Figure 1 and 2).

Table 1: List of ethno-medicinal plants recorded from Almora and Jageshwar, Uttarakhand, India

S. no.	Family	Scientific name	Plant part used	Medicinal importance
1	Aquifoliaceae	<i>Ilex dipyrena</i> Vern Himalayan holly Tree	Leaves	Leaf preparations used in the treatment for coughs digestive disorder, water retention, jaundice, joint pain and high blood pressure.
2	Asparagaceae	<i>Asparagus racemosus</i> Willd. Vern Satvari Shrub	Roots	The dried roots are used to cure indigestion.
3	Asteraceae	<i>Ageratum conyzoides</i> L. Vern Goat weed, Jangli pudina Shrub	Leaves and stem	Used against epilepsy, wounds, common cold, headaches, boils, eczema, bleeding wounds and burns.
4	Berberideaceae	<i>Berberis aristata</i> DC. Vern Kilmora	Root	Root bark used to treat malaria fever, in relieving pyrexia, as a wash for ulcer sores, as an eye lotion in conjunctivitis.

		Shrub		A watery solution is used as blood purifier.
5	Combretaceae	<i>Terminalia chebula</i> Retz. Vern Harar Tree	Fruit	Fruits rubbed in water on a clean stone and made into a paste are applied in eyes irritation and burning. Fruit powder or decoction is used as laxative.
6	Coriaceae	<i>Coraria nepalensis</i> Wall. Vern gangara , masuri , rikhola Tree	Bark	For emetic bark paste is applied in burns and scalds.
7	Cupressaceae	<i>Thuja occidentalis</i> L. Vern Mor pankhi Shrub	Leaves	Applied directly to the skin for joint pain, and muscle pain. <i>Thuja</i> oil used for skin diseases and as an insect repellent.
8	Ebenaceae	<i>Diopyrous malabarica</i> (Desr.) Kostel. Vern Gaab Tree	Fruit and bark	Fruits used for treatment of diarrhea and dysentery and also used as antidote for snake poisoning
9	Ericaceae	<i>Rhododendron arboretum</i> Sm. Vern Burash Tree	Flower	Extracted juice or squash of flowers is given during the heart problems and effective in diarrhea
10	Euphorbiaceae	<i>Ricinus communis</i> L. Vern erandi Tree	Leaf	Leaf paste with <i>Ocimum</i> leaf in equal quantity applied in effected area in mastoiditis.
11	Fabaceae	<i>Bauhinia vaariiegata</i> L. Vern Kachnar Tree	Root	Juice of root is given in snakebite and bark is used as a liver tonic and curing asthma.
12	Fagaceae	<i>Quercus leucotricophora</i> A.Camus Vern banj Tree	Bark	Boil 25g bark in 100ml water gargle in tonsillitis
13	Juglandaceae	<i>Juglas regia</i> L. Vern akhrot Tree	Whole plant	The branch and bark is used for cleaning of teeth and paste of leaf is applied on teeth during pain, seed oil is valuable for enhancing the memory.
14	Lamiaceae	<i>Rosmarinus officinalis</i> L. Vern Rosemary Shrub	Whole plant	Fresh and dried leaves of Rosemary used as herbal medicine in cold and fever. Also used as food preservative.
15	Lauraceae	<i>Cinnamomum tamala</i> Butch.- Ham. Vern tej patta Tree	Leaf and bark	Diabetes, cough, cold, arthritis, heart and liver health. Dried bark is used to treat stomach ache. Leaves in treatment of colic and diarrhea
16	Lauraceae	<i>Persea duthiei</i> Mill. Vern Mahilo kaulo Tree	Leaves	Decoction of leaves used externally as a wash in rheumatic joints and painful limbs.
17	Lythraceae	<i>Punica granatum</i> L. Vern Dharim Tree	Whole plant	Rind of fruit and bark are used as a traditional remedy against diarrhea, dysentery and intestinal parasites. The juice of fruit used in fever, diarrhea and weakness. Juice of fresh red flower and leaf is put in nose bleeding. Fruits and stem bark is cooked with jiggery and administered orally in asthma. Juice of the fruit boiled with podina (mint leaves) is administered in children in worn infection.
18	Malvaceae	<i>Bombax ceiba</i> L. Vern Semal Tree	Leaves	Paste of leaves is used over wound.
19	Mimosaceae	<i>Acacia dealbata</i> Link. Vern Khair Tree	Bark	Dried bark is used in the treatment of diarrhea and dysentery.
20	Moraceae	<i>Morus alba</i> L. Vern Shahtoot Tree	Fruit	Fruit juice is taken against cough and cold.
21	Moraceae	<i>Ficus auriculata</i> Lour. Vern Timil Tree	Leaves	50-100 ml fresh juice leaves with water for about 10 days can treat gastrointestinal problems. Also used as vegetable in constipation.
22	Moraceae	<i>Ficus palmata</i> Forsskal Vern Bedu Tree	Whole plant	Stem latex is applied to extract spines deeply lodged in the flesh. Fruit used in the treatment of constipation and diseases of the lungs and the bladder. Sap is used in the treatment of warts.
23	Moraceae	<i>Ficus religiosa</i> L. Vern Peepal Tree	Bark	Bark grounded with turmeric powder is applied externally on cuts, wounds and skin diseases.
24	Moraceae	<i>Ficus elastic</i> Robox. Ex Hornem. Vern Indian rubber bush Tree	Fruit	Fruit contains mucilage useful in stomach problems such as pain or digestive problems also used in healing wounds, cuts and sores.
25	Myricaceae	<i>Myrica esculenta</i> Buch.- Ham. Ex D.don Vern kafal Tree	Bark	Bark paste applied on wounds, joint pains and paralysis, fresh fruit highly effective in controlling blood problems and heart problems.
26	Mytaceae	<i>Pisidium guajava</i> Linn.	Fruits	Fruits roasted in hot ash and then administered orally in cough.

		Vern Amrood Tree		
27	Nyctaginaceae	<i>Bougainvillea buttiana</i> Holtum and Standl Vern Booganbel Climber/ Shrub	Whole plant	Aqueous decoction of plant used as fertility control. Have anticancer, anti-inflammatory, anti-diabetic and antioxidant properties.
28	Oleaceae	<i>Ligustrum japonicum</i> Thunb. Vern wax leaf privet Shrub	Fruit	Cardiotonic, diuretic, laxative and tonic treatment.
29	Pinaceae	<i>Cedrus deodara</i> Roxb.ex.D.Don Vern Deodar Tree	Stem	12-25 ml stem decoction used orally in fever.
30	Pinaceae	<i>Pinus roxburghii</i> Sarg Vern Chir Tree	Stem	Stem powder 1-3 g administered orally for one month in bladder stone.
31	Rosaceae	<i>Prunus Persia</i> L. Vern aaroo, aaru , aru Tree	Whole plant	Leaf extract used in treatment of gastritis, whooping cough, coughs and bronchitis. Seeds used in treatment of constipation. Fruit used in treatment of diarrhea and dysentery, to stop bleeding and to ease cough.
32	Rosaceae	<i>Prunus cerasoides</i> D.Don Vern Wild Himalayan cherry Tree	Leaves, stem	Stem powder is used to treat vomiting. The bark or wood is added to boiling water and given in fever.
33	Rosaceae	<i>Pyracantha crenulata</i> D.Don Vern ghingharu Shrub	Whole plant	Fruit used to maintain blood pressure, reduce cholesterol, rejuvenation of aged people, reduce joint pains and act as appetizer. Leaves used as herbal tea. Bark used in heavy bleeding during menstrual cycles and in treatment of fever (Malaria).
34	Rosaceae	<i>Rubus ellipticus</i> Smith Vern Hishalu Shrub	Root , shoot and fruit	Root decoction with <i>Girardinia diversifolia</i> root and bark of <i>Lagerstroemia parviflora</i> used in treatment of fevers, gastric troubles, diarrhea and dysentery. Roots and shoots for colic. Juice of fruit for fever, colic, coughs and sore throat. Treatment of skin diseases, wounds, and tumors. Juice of fruits is administered orally in cholera.
35	Rosaceae	<i>Pyrus pashia</i> L. Vern Mehal Tree	Fruit	Young fruit juice is used as eye drop during eye infection and fruit paste is applied on burn.
36	Rosaceae	<i>Prunus armeniaca</i> L. Vern Khubani Tree	Whole plant	Fruits are eaten fresh. Bark is used as an astringent to soothe irritated skin. Oil of seed is edible. Also used in asthma, constipation and cough.
37	Rosaceae	<i>Pyrus pyrifolia</i> (Burm.) Nak. Vern Nashi pear, Garmiho Tree	Bark and leaves	The bark is antiseptic and leaves are astringent
38	Rubiaceae	<i>Coprosma repens</i> A.Rich. Vern Mirror brush Shrub	Fruit	Treatment of kidney ailments and wounds that are not healing
39	Rubiaceae	<i>Leptodermis lanceolata</i> Wall. Vern Padar , koo-basya Shrub	Bark	Bark paste applied externally on forehead twice a day to treat migraine.
40	Rutaceae	<i>Aegle marmelos</i> L. Vern Srifal Tree	Leaves	Leaves powder is used in dysentery.
41	Rutaceae	<i>Murraya koenigii</i> L. Vern Curry patta Tree	Leaves	Paste is applied in skin disease.
42	Rutaceae	<i>Zanthoxylum armatum</i> DC. Vern Timur Tree	Whole plant	Bark, leaf and seed powder used in toothache, branches and for cleaning of teeth during gum problems. Leaves are also mixed in besan to make pakoras eaten few days to cure allergy.
43	Rutaceae	<i>Citrus limon</i> L. Vern Nimboo Tree	Fruit	Fruit juice used for gargle for sore throats. Skin of ripe fruit is made into powder mixed with a small amount of water and used as facial purposes and also cure skin
44	Sapindaceae	<i>Aesculus indica</i> Wall.	Fruit and	Warm paste of fruit is applied on affected part in skin ulcer.

		Colebr.ex(cambess).hook Vern Jangli pangar , pangar Tree	leaves	Tea made from the leaves is tonic and is used in treatment of fever and whooping cough.
45	Simaroubaceae	<i>Ailanthus excels</i> Roxb. Vern Mhanimb Tree	Whole plant	The leaves and fresh bark juice is used as a remedy for after pains. Bark used as powerful fever cure tonic
46	Solanaceae	<i>Withania somenifera</i> L. Vern ashwgandha Shrub	Root	Root cut into small pieces and dried used in treatment of inflammation of joint and hypertension. Root powder mixed with cow's milk and given during weakness, diabetes and for reducing stress
47	Solanaceae	<i>Nicandra physalodes</i> L. Vern Popti Shrub	Seeds	Seeds used in toothache, intestinal pain from worms. Seeds boiled with water and taken for fever indigestion and constipation.
48	Taxaceae	<i>Taxus baccata</i> L. Vern thuner Tree	Whole plant	Decoction of stem bark is administered orally and powder of leaves is administered orally in cough
49	Theaceae	<i>Camella sinensis</i> L. Vern Kunize Shrub	Whole plant	Leaves and seeds are used to treat asthma, angina pectoris, peripheral vascular disease and coronary artery diseases. Tea extract have antibacterial activities.
50	Verbenaceae	<i>Lantana camara</i> L. Vern Raimuniya Shrub	Leaves	Leaves display antimicrobial , fungicidal and insecticidal properties Used in herbal medicines for treatment of skin itches, leprosy, rabies, chicken pox, measles, asthma and ulcers.

Abbreviation- Vern- Vernacular name

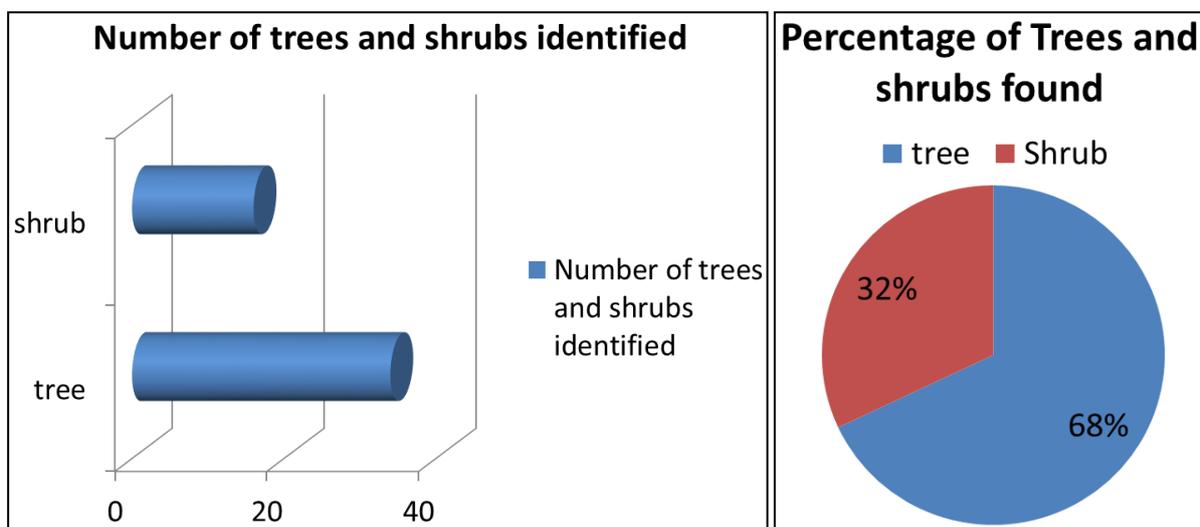


Fig 1, 2: Number of shrubs and trees recorded from the region.

Out of 28 families the most dominant family used in the treatment of various diseases and ailments is of Rosaceae comprising of 6 species used in the treatment of diseases

followed by Moraceae having 5 species of ethno-medicinal plants (Figure-3)

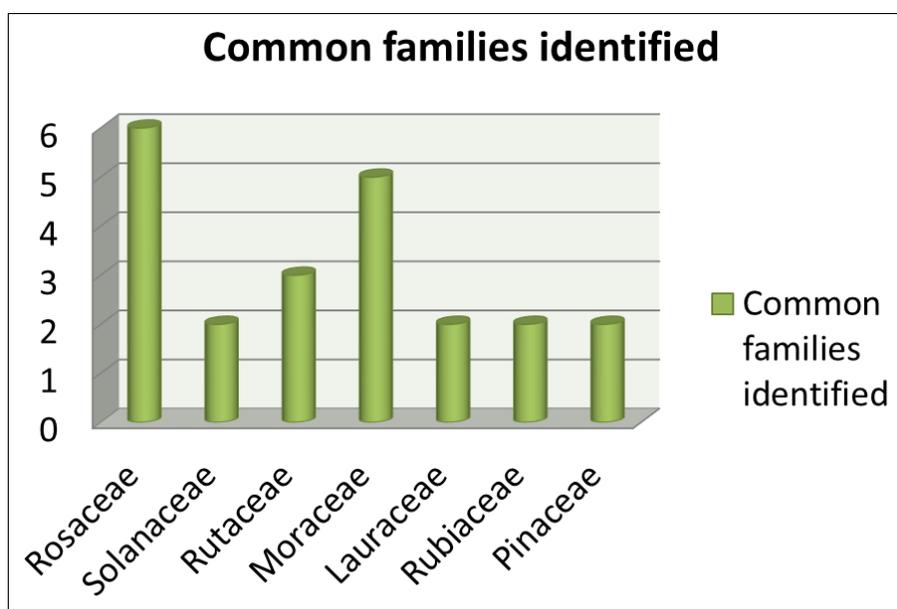


Fig 3: Dominant families of the ethno-medicinal plants growing in the region.

In terms of utilization of ethno-medicinal plants, the leaves are used in most number of cases with a total of 14 plants comprising the 25% of the total usage, the whole plant is used in 12 species with 21% usage, Fruits of 11 species with 20%

usage, Bark of 9 species used in 16% cases, Stems of 6 species used in 7% cases and seeds of 1 species used in 2% cases (Figure 4 and 5).

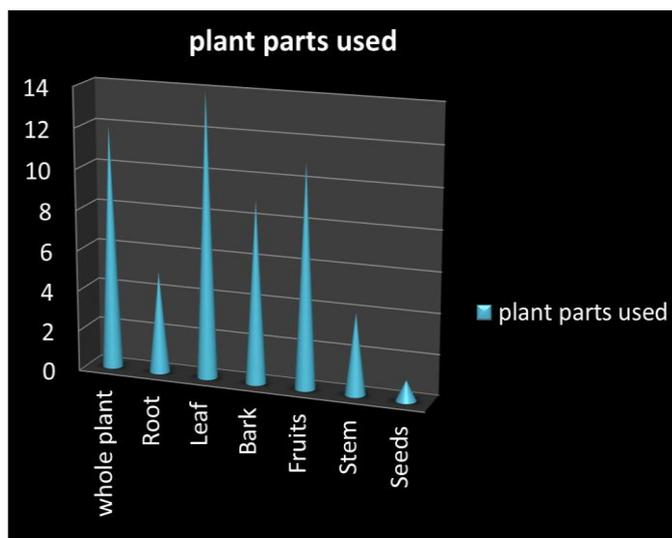


Fig 4: Number of the plant parts used in the ethno-medicinal treatment

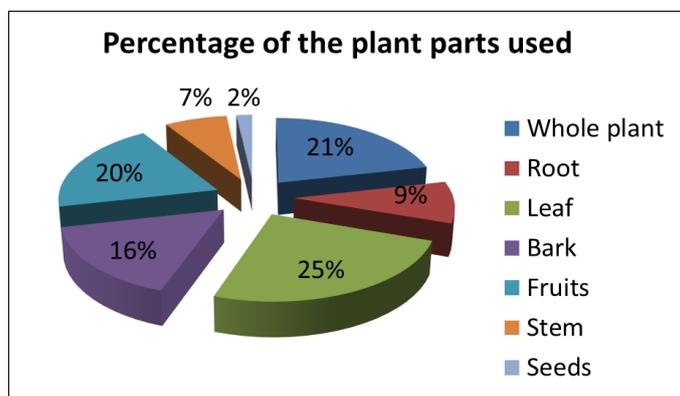


Fig 5: Utilization patterns of the ethno-medicinal plants parts for the treatment of various types of diseases.

The plant species are used to cure various types of ailments such as cough, cold, fever, dysentery, diarrhea, diabetes, kidney and heart problems, burns, cuts and wounds, joint and muscle pain, asthma, skin diseases, dental care, headache, swelling, snake poisoning.

A maximum of 19 species are used to cure cough, cold and fever such as *Cedrus deodara* (Kumari and Tiwari, 2011) [11], *Prunus persia*, *Pisidium guajava* (Arya et al. 2014) [2], *Berberis aristata*, *Morous alba*.

11 species of medicinally important plants is used to cure various skin diseases (*Thuja oil*, *Aesculus indica*, *Murraya koenigii*) such as ulcers *Lantana camara* (Khalita, 2012) [8], allergy, itches *Prunus armeniaca* (Raj et al. 2012) [13], Ear infection *Ricinus communis* (Gangwar et al. 2010) [3].

09 plants are used to cure digestive related problems such as indigestion, constipation, stomach ache. Common examples of such plants which are also reported to be used for digestive related problems are *Ficus palmate* (Joshi et al 2014) [6], *Ficus auriculata* (Kumari et al. 2011) [11], *Asparagus racemosus*, *Illex dipyrena*.

09 Plants are used in the treatment of cuts and wounds *Bombax ceiba*, *Ficus religiosa* (Arya 2014) [2] *Coraria nephalensis* in burns (Kumar P et al. 2011) [11] are some of the species.

08 plants are recorded to cure dysentery and diarrhea by the local peoples of the region which have been reported to be used in the similar ways by others such as *Prunus armenica* (Raj et al 2012) [13], *Rubus elipticus*, *Rhododendron arboreum*, *Acacia dealbata*, *Diopyrous malabarica*, 07 plant species are used to cure joint and muscle pain such as *Thuja occidentalis*.

Some of the major life-style diseases are also recorded to be treated by the recorded medicinal plant species. 06 species are used to cure heart related problems which includes blood purification, lowering the blood cholesterol level some of the species are *Myrica esculentha* and *Pyracantha crenulata* (Rana et al. 2018) [14]. 05 plant species are also used to cure another life-style disease asthma such as *Bauhinia vaariegata* (Kapkoti et al. 2014) [7], *Prunus armeniaca* (Raj et al.2012) [13].

03 species each in dental care *Zanthoxylum armatum* prominently used in herbal medicine to treat various dental problems such as gum problems and toothache. 03 species in burns, eye irritation, 02 in headache, snake poisoning, swelling and kidney problems each *Quercus leucotricophora* used to cure throat inflammation, Tonsillitis (Joshi and Juya, 2017) [5] (Figure 6).

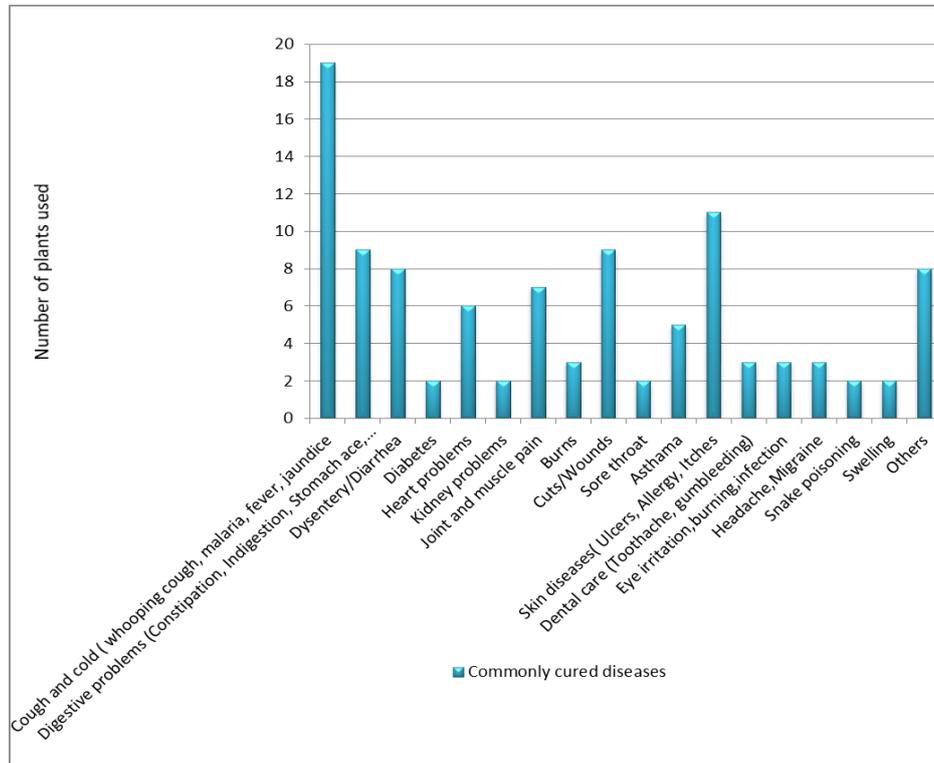


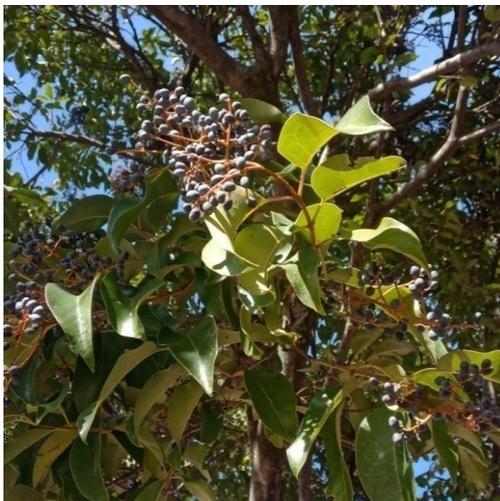
Fig 6: Commonly used medicinal plants to cure various diseases



Pyrus pashia



Citrus limon



Ligustrum japonicum



Machilus japonica

Plate 1



Rhododendron arboretum



Zanthoxylum armatum



Aesculus indica



Cinnamomum tamala

Plate 2



Cedrus deodara



Acacia dealbata



Juglans regia



Pinus roxburghii

Plate 3



Prunus persica



Quercus calliprinous



Punica granatum



Taxus baccata

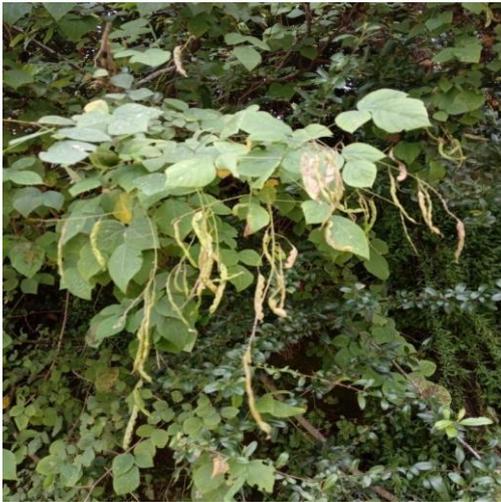
Plate 4



Coraria nepalensis



Ailanthus excels



Cladrastis kentukea



Cascabela thevetia

Plate 5



Lantana camara



Thuja occidentalis



Rubus ellipticus



Quercus leucotricophora

Plate 6



Leptodermis lanceolata



Rosemarinus officinalis



Pyracantha crenulata



Cotonester atropurpureus

Plate 7



Berberis aristata



Ficus palmata



Ricinus communis



Ageratum conyzoids

Plate 8



Purunus armeniaca



Asparagus racemosus

Plate 9

5. Conclusion

It is important to maintain the ecological balance between man and environment. Today ever growing numbers of peoples suffering from various kinds of diseases and causing a load on the well established medicinal sector so now it is important that the alternative medicinal system are taken into

consideration. The medicinal plants which are being used by the local peoples of the region are not only cost efficient but also shows a prominent potential in curing various types of diseases and ailments with little to no side-effects. Now is the time that these forms of alternative medicines (Aurveda, Unani) together with the modern medicinal systems used for

the better future medicinal facilities and curing patients. There is a decline in the medicinal plant diversity of the region due to overexploitation of the medicinal plants and the growing tourism. So, it is also important that overexploitation these valuable medicinal diversity should be prevented. The medicinal plants having a commercial importance should be highlighted and encouraged for cultivation in this way it will help to generate income as well as conserve the genetic biodiversity. From the recorded data two species *Rosmarinus officinale* and *Asparagus racemosus* Uttarakhand State Medicinal plant board (SMPB) is providing assistance for overall coordination of the activities in Medicinal and Aromatic Plants sector in the state (SMPB Uttarakhand) from a total of 28 plant species for commercial production and conservation of genetic biodiversity. Thus there is a need that the ethno-medicinal diversity and knowledge need to be recorded and documented as this knowledge system is rapidly disappearing. So, it is important to preserve this valuable resource in which both government and NGOs can play their role. The rapidly misbalance in ecosystem, overexploitation, introduction of invasive species, and the modern culture is rapidly cause loss of such valuable resource.

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