Ethnomedicinal study of wild plants used by fringe communities of outer Seraj region of Kullu district of Himachal Pradesh, northwestern Himalaya

NISHA*, RAJ KUMAR and RHYTHM GOSWAMI

ICFRE – Himalayan Forest Research Institute, Conifer Campus
Panthaghati, Shimla 171013 Himachal Pradesh, India
*Email for correspondence: nisha2092sharma@gmail.com/presstonisha@gmail.com

 Received: 24.04.2024/Accepted: 31.05.2024

ABSTRACT

This survey investigated about 52 medicinal plant species belonging to 37 different families representing herbs (33), trees (9), shrubs (8) and ferns (2) that were being used by fringe communities of outer Seraj of Kullu district, Himachal Pradesh to treat different ailments. The most widely used plant parts included leaves, roots, fruits, seeds, flowers, bark, rhizomes, tubers and twigs. The local people preferred these plants for treating various ailments like cough, fever, wounds, joint pain, dysentery, jaundice, paralysis, toothache, diabetes, piles, leprosy, bronchitis, asthma etc. This study is definitely going to serve as a future reference material for researchers in the field of systematic, biochemical and pharmacological studies.

Keywords: Medicinal plants; ailments; plant parts; fringe communities

INTRODUCTION

Western Himalayan region is home to a wide variety of plants that have been used as herbal medications by the local communities for centuries for treating various ailments. These herbal medications contain phytochemicals like vitamins, proteins, carbohydrates, dietary fibers, amino acids, minerals, steroids, alkaloids, glycosides, tannin, phenolics and flavonoids (Debnath et al 2021). The past studies on medicinal and aromatic plants reported that about 90 per cent medicinal plants were extracted from wild and 70 per cent collected through destructive harvesting. Various anthropogenic activities, particularly unsustainable harvesting, grazing, over-exploitation, invasive plants, forest fires, diseases etc affect floristic diversity. Such conditions lead to changes in the vegetation patterns and decline in the populations of medicinal and aromatic plants. In addition, the traditional practices and rich indigenous knowledge of medicinal plants possessed by local villagers have been diminishing fast due to modernization. Keeping this in view, the present study was carried out in the outer Seraj area of Kullu, Himachal Pradesh to know the status of ethnomedicnal plants.

In the developing world, majority of the rural communities possess important knowledge of plants which they have inherited from their forefathers (Yusuf et al 2007). About 75-80 per cent of the world population, mainly in the developing countries, still depend upon the herbal medicines for primary healthcare services due to their better compatibility with the human body and lesser known side effects (Kamraj 2000).

Various studies have been carried out on the documentation of medicinal plants diversity in the Indian Himalayan region (Jain 1991, Maikhuri et al 1998, Samant et al 1998, Chauhan 1999, Joshi et al 1999, Sood et al 2001, Dhar et al 2002, Samant and Pal 2003, Seth and Jaswal 2004, Rawat 2005, Rawat and Garg 2005, Kala 2006, Samant and Pant 2006, Uniyal et al 2006, Samant et al 2007, Rawat et al 2009, Singh et al 2009, Semwal et al 2010). In general, studies on medicinal plants in the Kullu district, Himachal Pradesh have been carried out on diversity, distribution pattern and indigenous uses (Singh 2004, Boktapa and Sharma 2010, Rana and Samant 2011a), conventional propagation (Butola and Badola 2004, 2006, Butola and Samant 2006, Butola et al 2010), threatened plants

(Butola and Badola 2008, Pant and Samant 2008, Rana and Samant 2011b) and agro-techniques (Samant et al 2008).

Outer Seraj, where the current study was focussed on, is encircled by lofty mountains and deep gorges supporting diverse vegetation. This region holds great diversity of medicinal and other useful plants due to diverse climatic conditions (Singh and Rawat 1999). The majority of these plants hold traditional medicinal, folk and industrial uses in Himachal Pradesh (Kumar et al 2013). Indigenous people of outer Seraj have been using medicinal herbs for treating various ailments in their daily life since time immemorial (Kaur et al 2011).The preservation of indigenous knowledge has become an urgent need for the society. Therefore, there is an urgent need to document various ethnomedicinally important plant resources of this area. This study is definitely going to serve as a future reference material for science in the field of systematic, biochemical and pharmacological studies. Further studies on developing farming techniques of commercially viable medicinal species, conservation of natural habitats, frequent monitoring of populations and habitat modeling and preservation of traditional knowledge are also recommended.

METHODOLOGY

Outer Seraj, one of the most beautiful regions of the middle Himalayas, is characterized by its unique ecosystem with a wide range of climates and habitat types which support diverse vegetation. It is situated between 31°39'32" N latitude and 77°23'12" E longitude, covering an area of 906.41 ha and elevation range from 700 m to 5,500 m amsl. The map of the outer Seraj is shown in Fig 1. Surveys were conducted in 30 villages each from Anni and Nirmand blocks of Kullu district.

The present study included ethnomedicinal survey based on semi-structured questionnaires which was conducted in the year 2022 and 2023. During the survey, villagers were surveyed at household level where 20-25 per cent households from each village were covered. Data were collected on local names, part(s) used and indigenous uses of the plants. The informants included men, women, youths and elders between the age of 28 and 80 years. The information was documented and analyzed for various parameters. Collection of fresh samples was done and identified with the help of sources on local flora (Collett 1902, Aswal and Mehrotra 1994, Dhaliwal and Sharma 1999, Singh and Rawat 2000).

RESULTS and DISCUSSION

The current study witnessed the use of 52 species for medicinal purposes in outer Seraj area of Kullu district, Himachal Pradesh. The detailed information regarding ethnomedicinal uses of plant species is presented in Table.1. Different plant part(s) such as leaves, roots, tubers, seeds, fruits, flowers, bark, tubers, rhizomes and twigs were used by the native communities for the treatment of different ailments. A total of 52 plant species belonging to 37 plant families and 50 genera were recorded and identified which were being utilised by the indigenous people (Table 1).

The most dominant families of plants that were utilised by the local people included Asteraceae (3), Lamiaceae (3), Poaceae (3), Rutaceae (3), Amaranthaceae (2), Sapindaceae (2), Apiaceae (2), Berberidaceae (2), Rosaceae (2) and Polygonaceae (2) (Fig 2). The species diversity comprised 33 herbs, 8 shrubs, 9 trees and 2 ferns (Fig 3). Some important medicinal plants of the region are depicted in Plate 1.

Among parts used, leaves (23), roots (15), fruits (8) seeds (5), flowers (3), whole plant (2), bark (2), rhizomes (1), tubers (1), twigs (1) and fronds (1) were used ethnomedicinally (Fig 4).

The common diseases treated were cold, cough, fever, sore throat, wounds, joint pain, dysentery, jaundice, toothache, piles, diabetes etc. During current study, some plants were found to be used for the treatment of a single disease while many other wildly growing plants had multiple therapeutic uses. However, information on the indigenous usage of plants was mostly confined to elder people (>50 years of age). The younger generations were ignorant about various indigenous usages of plants. Therefore, transfer of traditional knowledge to them has been declining, thus substantiating the need for its documentation, before it is lost forever.

CONCLUSION

Ethnomedicinal studies play an important role in the modern drug development programmes from utilizing plant resources. In the present study, efforts were made to provide baseline information of plants

Table1. Ethnomedicinal plants used by fringe communities of outer Seraj, Kullu district, Himachal Pradesh

Taxa	Family	Common name	Habit	Part(s) used	Disease/ailment	Mode of application
Achyranthes aspera L	Amaranthaceae	Puthkanda, Apmarga	H	Wp	Bronchial infection, wounds, boils, joint pain, toothache	Dried roots powdered and paste applied on wounds twice a day; fresh stems chewed to cure toothache; leaf decoction used for bronchial infection
Aconitum heterophyllum Wall ex Royle	Ranunculaceae	Patish	H	Rt	Cough, diarrhoea, digestive problem, dysentery	Dried roots powdered, mixed with sugar and taken orally with lukewarm water twice a day for 3-4 days
Acorus calamus L	Araceae	Buch	H	Rt	Stomach complaints, cuts, wounds	Dried root powder decoction taken orally with lukewarm water once a day for treating stomach problems; dried root paste applied on cuts and wounds
Adiantum venustum D Don	Adiantaceae	Raj	Frn	Lf	Cuts, wounds	Leaf paste applied on cuts for relieving pain and has wound healing property
Aesculus indica (Wall ex Cambess) Hook	Sapindaceae	Khanor	T	Sd	Reproductive problems	Dried seeds grounded into flour and used as tonic for ladies to treat reproductive problems
Ainsliaea aptera DC	Asteraceae	Karubooth	H	Rt	Acute gastric pains, diarrhoea, stomach ache, cold	Powdered dried roots given with milk or lukewarm water twice a day for 4-5 days
Ajuga bracteosa Wall ex Benth	Lamiaceae	Neelkanthi	H	Lf, Rt	Hypertension, rheumatism, gout, blood purifier, stimulant	Dried roots grinded and taken in powder form with warm water act as blood purifier and stimulant; leaf decoction taken to cure hypertension; leaf paste applied for rheumatism and gout
Aloe vera (L) Burm f	Liliaceae	Ghritkumari	H	Lf	Skin diseases	Leaf pulp applied on face for skin care
Angelica glauca Edgew	Apiaceae	Chora	H	Rt	Dyspepsia, diarrhoea, gastric problems, stomach ache, vomiting	Dried root powder taken orally with lukewarm water twice a day for one week
Arnebai benthami (Wall ex G Don) IM Johnst	Boraginaceae	Ratanjot	H	Rt	Hair problems	Dried roots in powder form soaked in mustard oil and applied on hair directly
Artemisia annua L	Asteraceae	Malaria butti	H	Lf	Anti-malarial, antibacterial	Leaf decoction used twice a day
Artemisia roxburghiana Besser	Asteraceae	Bichubooti	H	Lf	Cuts, wounds	Leaf paste applied on cuts and wounds to stop bleeding
Berberis aristata DC	Berberidaceae	Kashmal	Sh	Fl	Acidity, jaundice, piles	Flowers boiled in water and filtered; extract taken once a day orally to treat acidity, jaundice and piles
Berberis lycium Royle	Berberidaceae	Kashmal	Sh	Rt	Jaundice, cough, malaria, cold	Powdered root decoction mixed with honey taken orally
Bergenia ciliata (Haw) Sternb	Saxifragaceae	Pashanved	H	Rt	Kidney/bladder stones	Dried root powder taken orally with lukewarm water
Bryophyllum pinnatum (Lam) Oken	Crassulaceae	Goodluck leaf	H	Lf	Wounds	Leaf paste applied on wounds
Cannabis sativa L	Cannabaceae	Bhang	H	Lf	Swelling (insect-bite)	Leaves rubbed on body to negate the effect of insect bite particularly against swelling developed by the sting of honeybee and Bichu-Butti
Centella asiatica (L) Urb	Apiaceae	Brahmi	H	Lf	Memory loss	Leaves crushed, decoction taken with black pepper, one teaspoon twice a day to treat the patients suffering from loss of memory
Chenopodium album L	Amaranthaceae	Bathu	H	Sd	Skin diseases, headache	Roasted seeds eaten to revive taste; cure skin diseases and headache
Cyanodon dactylon (L) Pers	Poaceae	Doob	H	Lf	Bleeding	Leaf juice of leaves applied on nose to stop bleeding
Cymbopogon citratus (DC) Stapf	Poaceae	Lemon grass	H	Lf	Digestive complaints	Leaves used for flavouring tea which helps in improving digestion
Dactylorhiza hatagirea (D Don) Soó	Orchidceae	Salam panja	H	Rt	Weakness, diabetes, weakness, dysentery, diabetes, loose motions	Powdered root decoction filtered through cotton cloth and given to the person suffering from general

Taxa	Family	Common name	Habit	Part(s) used	Disease/ailment	Mode of application
Diplazium esculentum (Retz) Sw	Athyriaceae	Lingad	Frn	Lf, Frd	Indigestion	Fronds and leaves cooked as vegetable to improve digestion
Eleusine coracana (L) Gaertn	Poaceae	Koda, Kodra, Mandua	H	Sd	Whooping cough, common cold	Dried seeds grounded and mixed with wheat flour
Gentiana kurroo Royle	Gentianaceae	Karu	H	Rt	Fever	One tea spoon of powdered root taken with honey during fever
Juglans regia L	Juglandaceae	Akhrot, Khod	T	Lf, Fr, Bk	Toothache	Leaves and fruits used to cure tooth decay; bark used to clean teeth
Justicia adhatoda L	Acanthaceae	Basuti	Sh	Lf	Asthma, fever, cough, cold	Leaves grounded with flowers of *Hibiscus rosa-sinensis* and taken orally to treat asthma, reducing fever, cough and cold
Mentha longifolia (L) Huds	Lamiaceae	Jungli pudina	H	Lf	Indigestion, vomiting, headache	Leaves commonly used to make chutney
Murraya koenigii (L) Spreng	Rutaceae	Cury patta	Sh	Lf	Indigestion	2-3 leaves chewed directly to improve digestion
Oxalis corniculata L	Oxalidaceae	Malori	H	Lf	Dysentery	Leaves used as chutney and given for the treatment of dysentery
Phyllanthus emblica L	Phyllanthaceae	Aonla	T	Fr	Stomachache, eye complaints, fever, arthritis	Fruits eaten directly or in powder form
Picrorhiza kurroa Royle ex Benth	Plantaginaceae	Kutki	H	Lf, Rt	Fever, stomachache	Chewing of 2-3 leaves acts as antipyretic; roots boiled in water and taken to cure stomachic problem
Polygonatum verticillatum (L) All	Asparagaceae	Salam Misri	H	Tb, Rh	Kidney stone	Powdered roots with lukewarm water taken orally
Prunus cornuta (Wall ex Royle) Steud	Rosaceae	Bird cherry	T	Fr, Sd	Diabetes	Fruits edible; seeds crushed and taken internally
Punica granatum L	Punicaceae	Daru	T	Fr	Sore throat	Fruit powder taken with honey
Rheum moorcroftianum Royle	Polygonaceae	Chukhri	H	Rt	Cuts, wounds	Root paste applied on cuts and wounds
Rhododendron arboreum Sm	Ericaceae	Buras	T	Fl	Dysentery, diarrhoea	Flower juice taken for one week
Rubia cordifolia L	Rubiaceae	Majishtha	H	Rt	Irregular menstruation	Root decoction with sugar given to women
Rubus ellipticus Sm	Rosaceae	Hinsar	Sh	Fr	Cough, fever	Ripen fruits eaten directly
Rumex nepalensis Spreng	Polygonaceae	Malora	H	Lf	Constipation, acidity, skin problems	Leaves consumed as vegetable
Sapindus mukorossi Gaertn	Sapindaceae	Reetha	T	Fr	Hair problems	Dried fruit powder used as a foaming agent and acts as hair cleanser
Skimmia laureola (DC) Decne	Rutaceae	Nair	Sh	Lf	Headache	Leaf infusion taken to cure headache
Solanum nigrum L	Solanaceae	Makoi	H	Lf, Fr	Dysentery, leucoderma	Tender leaves eaten to treat dysentery; green fruit paste applied on leucoderma
Syzygium cumini (L) Skeels	Myrtaceae	Jamun	T	Fr	Diabetes	Fruits consumed directly
Taxus wallichiana Zucc	Taxaceae	Rakhal	T	Bk	Cancer	Bark very often used in tea
Thymus serpyllum L	Lamiaceae	Ban ajwain	H	Wp	Cough, cold and fever	Decoction of whole plant is taken twice a day
Trillium govanianum Wall ex D Don	Trilliaceae	Nagchatri	H	Rt	Diarrhoea	Roots boiled in milk and consumed
Urtica dioca L	Urticaceae	Bichu-Butti	H	Lf	Blood purification	Leaves boiled in water and cooked as vegetable
Valeriana jatamansi Jones ex Roxb	Valerianaceae	Mushkbala	H	Lf	Stomachache	Leaf decoction taken twice a day
Viola canescens Wall	Violaceae	Vanfsha	H	Fl, Lf	Cough, cold, sore throat	Flower and leaf decoction taken for 3-4 days
Withania somnifera (L) Dunal	Solanaceae	Ashwagandha	Sh	Rt	Mental disorder	Root powder given for physical and mental strength
Zanthoxylum armatum DC	Rutaceae	Tirmir	Sh	Tw, Sd	Toothache	Young twigs and seeds chewed to relieve toothache

WP = Whole plant, Rt = Root, Lf = Leaf, Sd = Seed, Fl = Flower, Frd = Frond, Bk = Bark, Fr = Fruit, Tw = twigs, Rh = Rhizome, Tb = Tuber

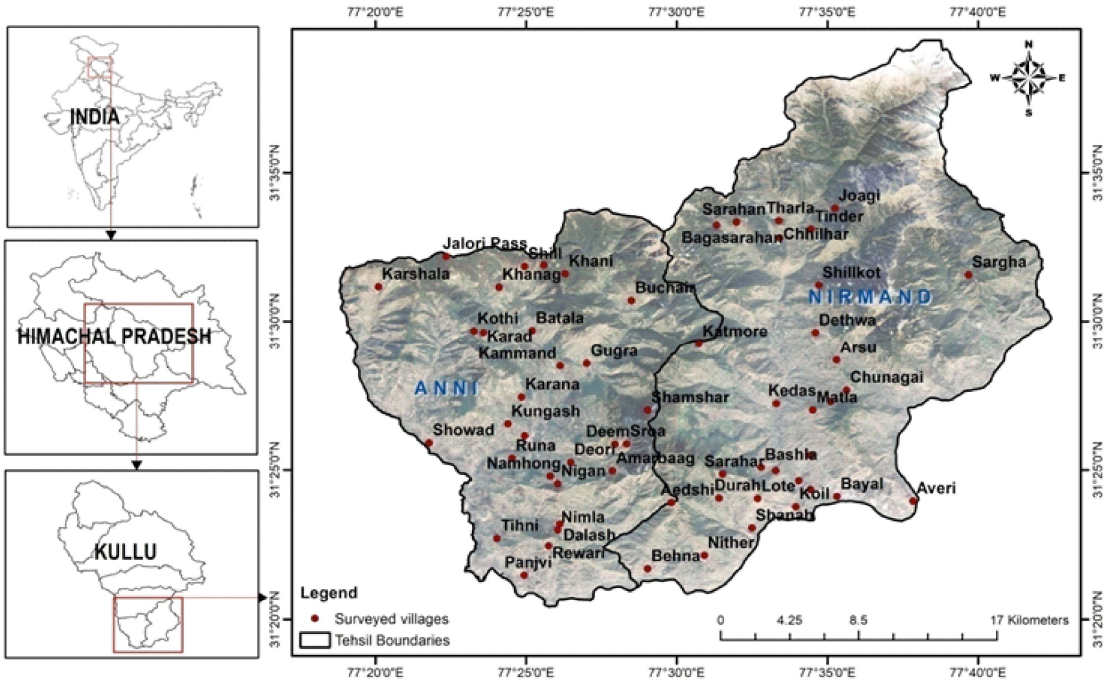


Fig 1. Map of the study area

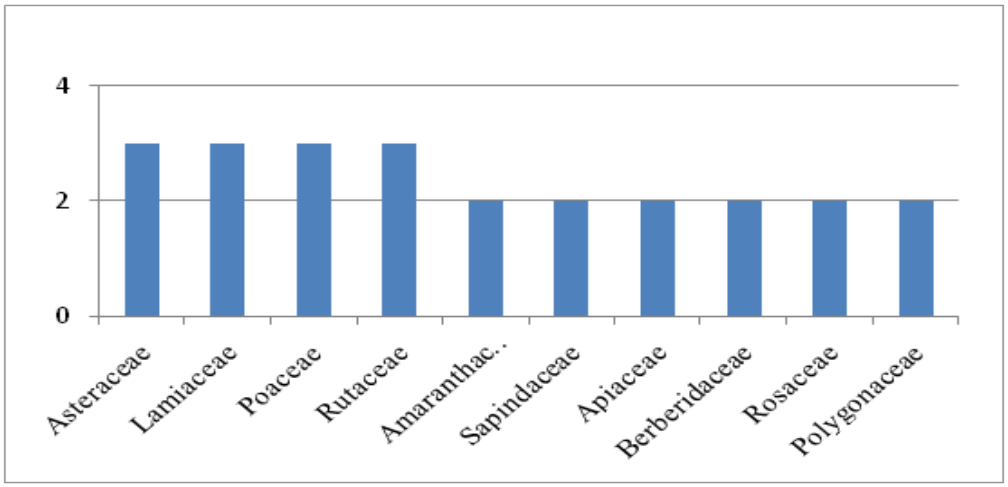


Fig 2. Contribution of dominating families in species distribution

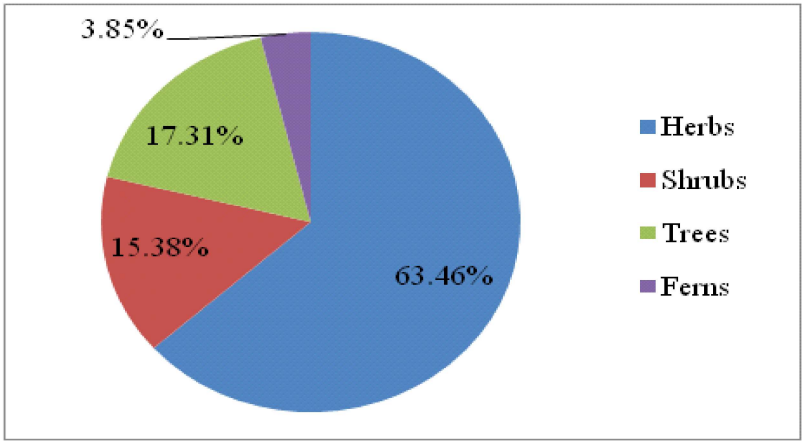
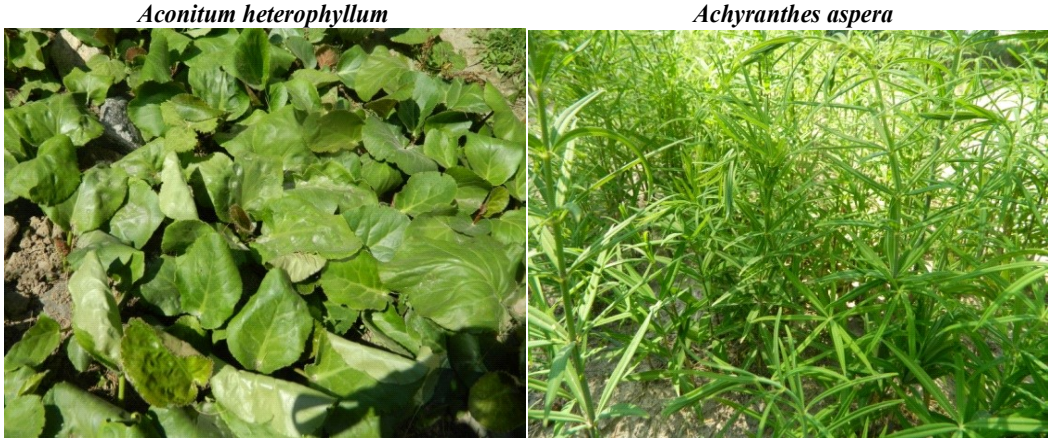


Fig 3. Habit-wise distribution of wild medicinal plants

Aconitum heterophyllum *Achyranthes aspera*



Bergenia ciliata *Polygonatum verticillatum*

Plate 1. Some important medicinal plants of Seraj region, Kullu district, Himachal Pradesh

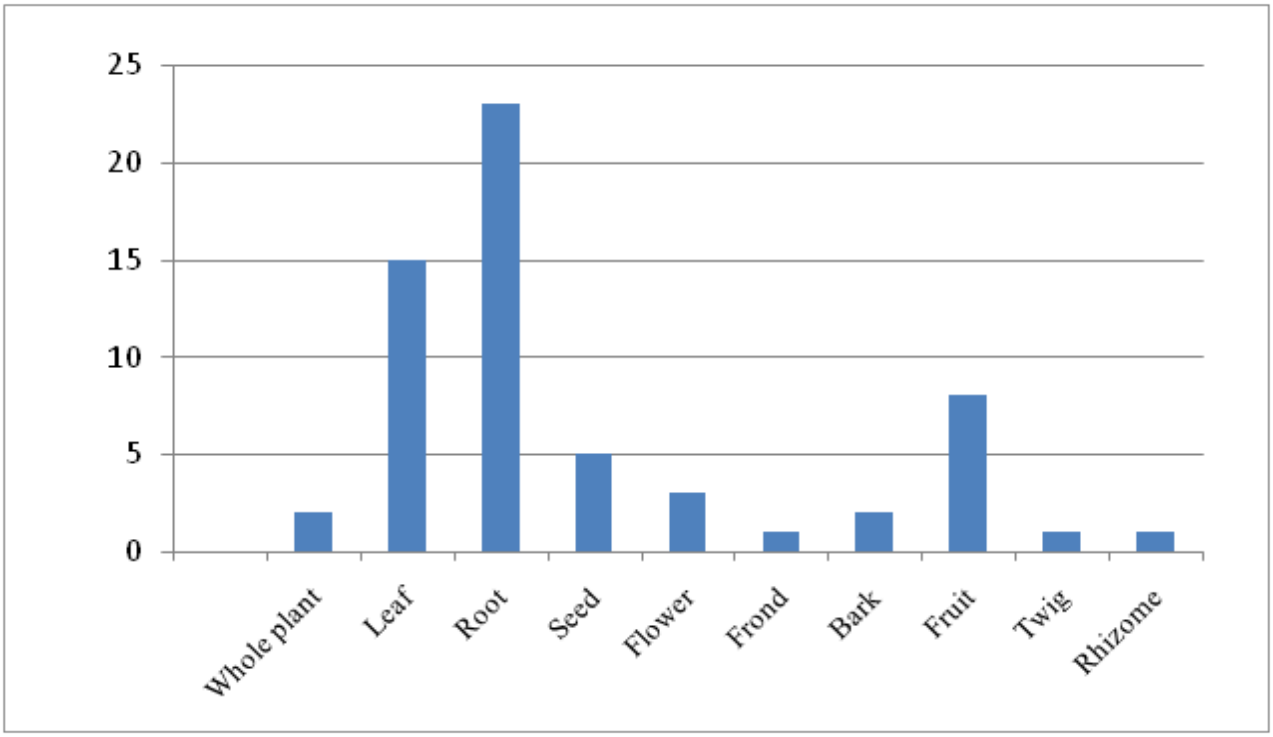


Fig 4. Usage of different plant parts

used to treat different diseases and traditional knowledge of the fringe communities of outer Seraj area of Kullu district, Himachal Pradesh. This research work will not only provide recognition to plant wealth but also help in the conservation of these medicinal plants for further researchers worldwide.

The plant biodiversity, traditional knowledge and cultural practices of the rural people are facing threat due to the construction of highways and the development of the area as a major tourist attraction. Moreover, unscientific and ruthless exploitation coupled with habitat degradation of these species has been resulting in imminent danger of extinction of these species. The present study revealed that traditional knowledge of medicinal plants was confined to old and elderly people and young generation was almost unaware of the vast medicinal plant wealth. It will result in diminishing of the traditional knowledge. This information was being passed from generation to generation vocally due to the lack of proper documentation. Therefore, there is an urgent need to document the precious knowledge of indigenous practices to reflect the restoration of interest in the traditional medicines. The scientific validation of these remedies may help in discovering new drugs from these plant species. The information on therapeutic uses of plants may provide a great potential for discovering new drugs and promoting awareness among the tribal people to use them as remedy in healthcare system with supreme accuracy and knowledge.

ACKNOWLEDGMENT

The authors are highly grateful to the local communities of outer Seraj region of Kullu district, Himachal Pradesh for their willingness to share their valuable empirical knowledge and experiences on wild medicinal plants.

REFERENCES

Aswal BS and Mehrotra BN 1994. Flora of Lahaul-Spiti – a cold desert in northwest Himalaya. Bishen Singh Mahendra Pal Singh, Dehradun, Uttarakhand, India.

Boktapa NR and Sharma AK 2010. Wild medicinal plants used by local communities of Manali, Himachal Pradesh, India. Ethnobotanical Leaflets **14:** 259-267.

Butola JS and Badola HK 2004. Effect of pre-sowing treatment on seed germination and seedling vigour in *Angelica glauca*, a threatened medicinal herb. Current Science **87(6):** 796-799.

Butola JS and Badola HK 2006. Chemical treatments to improve seedling emergence, vigour and survival in *Heracleum candicans* Wall (Apiaceae): a high value threatened medicinal and edible herb of Himalaya. Journal of Plant Biology **33(3):** 215-220.

Butola JS and Badola HK 2008. Threatened Himalayan medicinal plants and their conservation in Himachal Pradesh. Journal of Tropical Medicinal Plants **9(1):** 125-142.

Butola JS and Samant SS 2006. Physiological studies on seed germinationof *Angelica glauca* Edgew. Journal of Tropical Medicinal Plants **7(2):** 205-212.

Butola JS, Vashistha RK, Malik AR and Samant SS 2010. Assessment of inter-population variability in *Heracleum candicans* Wall with emphasis on seed characteristics and germination behaviour. Journal of Medicinal Plants Research **4(15):** 1523-1534.

Chauhan NS 1999. Medicinal and aromatic plants of Himachal Pradesh. Indus Publishing Company, New Delhi, India, 632p.

Collett H 1902. Flora simlensis – a handbook of the flowering plants of Simla and the neighbourhood. 1st Edn, Thacker Spink and Company, Calcutta, Simla and London.

Debnath B, Singh WS, Goswami S and Manna K 2021. Taxonomical, phytochemical, traditional explanation, nutritional values, and biological activities of certain edible medicinal plants of Tripura, India. Journal of Natural Remedies **21(3):** 173-188.

Dhaliwal DS and Sharma M 1999. Flora of Kullu district (Himachal Pradesh). 1st Edn, Bishen Singh Mahendra Pal Singh, Dehradun, Uttarakhand, India.

Dhar U, Manjkhola S, Joshi M, Bhatt A, Bisht AK and Joshi M 2002. Current status and future strategy for development of medicinal plants sector in Uttaranchal, India. Current Science **83(8):** 956-964.

Jain SK 1991. Dictionary of Indian folk medicine and ethnobotany – a reference manual of man-plant relationships, ethnic groups and ethnobotanists in India. Deep Publications, New Delhi, India, 311p.

Joshi HC, Arya SC and Samant SS 1999. Diversity, distribution and indigenous uses of medicinal and edible plants in a part of Nanda Devi Biosphere Reserve-I. Himalayan Biosphere Reserves **1:** 49-65.

Kala CP 2006. Medicinal plants of the high altitude cold desert in India: diversity, distribution and traditional uses. International Journal of Biodiversity Science and Management **2(1):** 43-56.

Kamraj VP 2000. Herbal medicine. Current Science **78:** 35-39.

Kaur I, Sharma S and Lal S 2011. Ethnobotanical survey of medicinal plants used for different diseases in Mandi district of Himachal Pradesh. International Journal of Research in Pharmacy and Chemistry **1(4):** 1167-1171.

Kumar S, Chand G, Sankhyan P, Manojkumar VC, Gupta V, Keshari BB, Sase S, Limaye RP, Soni N, Gaikwad S, Sundaresan S, Senthilkumar B, Barik LD, Mishra SP, Dwivedi US and Sahu M 2013. Herbal folk remedies for curing various ailments in Lug valley of district Kullu, Himachal Pradesh (NW Himalaya). International Journal of Ayurvedic and Herbal Medicine **3(5):** 1308-1314.

Maikhuri RK, Nautiyal S, Rao KS and Saxena KG 1998. Role of medicinal plants in traditional healthcare system: a case study form Nanda Devi Biosphere Reserve. Current Science **75(2):** 152-157.

Pant S and Samant SS 2008. Population ecology of the endangered Himalayan yew in Khokhan Wildlife Sanctuary of northwestern Himalaya for conservation management. Journal of Mountain Science **5(3):** 257-264.

Rana MS and Samant SS 2011a. Diversity, indigenous uses and conservation status of medicinal plants in Manali wildlife sanctuary, northwestern Himalaya. Indian Journal of Traditional Knowledge **10(3):** 439-459.

Rana MS and Samant SS 2011b. Population biology of *Lilium polyphyllum* D Don ex Royle – a critically endangered medicinal plant in a protected area of northwestern Himalaya. Journal of Nature Conservation **19(3):** 137-142.

Rawat GS 2005. Alpine meadows of Uttaranchal: ecology, land use and status of medicinal and aromatic plants. 1st Edn, Bishen Pal Singh Mahendra Pal Singh, Dehradun, Uttarakhand, India, 219p.

Rawat RBS and Garg GP 2005. Medicinal plants: trade and commerce opportunities with India. Indian Forester **131(3):** 275-287.

Rawat RS, Jishtu V and Kapoor KS 2009. Medicinal and aromatic plant diversity of Himalayan cold desert with reference to Spiti valley of northwest Himalayas. Indian Forester **135(7):** 891-904.

Samant SS and Pal M 2003. Diversity and conservation status of medicinal plants in Uttaranchal state. Indian Forester **129(9):** 1090-1108.

Samant SS and Pant S 2006. Diversity, distribution pattern and conservation status of plants used in liver diseases/ailments in Indian Himalayan region. Journal of Mountain Science **3:** 28-47.

Samant SS, Butola JS and Lal M 2008. Agrotechniques of commercially viable medicinal plants in the Indian Himalayan Region. GB Pant Institute of Himalayan Environment and Development, Himachal Unit, Mohal-Kullu, Himachal Pradesh, India.

Samant SS, Dhar U and Palni LMS 1998. Medicinal plants of Indian Himalaya: diversity, distribution, potential values. Gyanodaya Prakashan, Nainital, Uttarakhand, India, 161p.

Samant SS, Pant S, Singh M, Lal M, Singh A, Sharma A and Bhandari S 2007. Medicinal plants in Himachal Pradesh, northwestern Himalaya. International Journal of Biodiversity Science and Management **3(4):** 234-251.

Semwal DP, Sarathi PP, Kala CP and Sajwan BS 2010. Medicinal plants used by local Vaidyas in Ukhimath block, Uttarakhand. Indian Journal of Traditional Knowledge **9(3):** 480-485.

Seth MK and Jaswal S 2004. An enumeration of the plant resources of Shimla (Himachal Pradesh). International Book Distributors and Publishers, Dehradun, Uttarakhand, India, 180p.

Singh A, Lal M and Samant SS 2009. Diversity, indigenous uses and conservation prioritization of medicinal plants in Lahaul valley, proposed Cold Desert Biosphere Reserve, India. International Journal of Biodiversity Science and Management **5(3):** 132-154.

Singh SK 2004. Ethno-medicinal plants of Kullu valley, Himachal Pradesh. Journal of Non-Timber Forest Products **11(1):** 74-78.

Singh SK and Rawat GS 1999. Floral diversity and vegetation structure in great Himalayan national park, western Himalaya. FREEP-GHNP Research Project 02/05, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand, India.

Singh SK and Rawat GS 2000. Flora of Great Himalayan National Park, Himachal Pradesh. 1st Edn, Bishen Pal Singh Mahendra Pal Singh, Dehradun, Uttarakhand, India, 304p.

Sood SK, Nath R and Kalia DC 2001. Ethnobotany of cold desert tribes of Lahaul-Spiti (NW Himalaya). Deep and Deep Publications, New Delhi, India 228p.

Uniyal SK, Kumar A, Lal B and Singh RD 2006. Quantitative assessment and traditional uses of high value medicinal plants in Chhota Bhangal area of Himachal Pradesh, western Himalaya. Current Science **91(9):** 1238-1242.

Yusuf M, Wahab MA, Yousuf M, Chowdhury JU and Begum J 2007. Some tribal medicinal plants of Chittagong hill tracts, Bangladesh. Bangladesh Journal of Plant Taxonomy **14(2):** 117×128.