

DOCUMENTATION AND UTILIZATION OF MEDICINAL PLANTS USED BY RURAL PEOPLE OF GARHWAL HIMALAYA, INDIA

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Abstract

The present study provides the information about medicinal plants in Garhwal Himalaya, Uttarakhand, India. The objective of the study was to document the available important medicinal plant species and their use in several different health issues of rural people. Numerous ethno-medicinal surveys were conducted in the villages of Chamoli, Pauri and Rudraprayag districts during 2014. Data on different aspects of medicinal plants were collected by interviewing the local communities, following a simple random sampling method with at least 5 % sampling from each village. During survey, a total of 66 important plant species were recorded, from most of which roots (40 %) are used. Maximum number of species was recorded from the family Asteraceae (5 species). In present study area, due to over exploitation and unsustainable harvesting, several important commercial medicinal plants are facing great threats and need to be conserved properly. Moreover, lack in interest of present generation about the use of medicinal plants augments the threat. Therefore, suitable conservation planning is strongly recommended to conserve medicinal plants including biomedical research, transfer of technology to harvest the existing medicinal plants sustainably, organization of educational and awareness programmes among local communities.

Key words: conservation, medicinal plants, traditional knowledge.

Introduction

Since ancient times, plants are serving human being several useful purposes starting from food, shelter, wear, amusement, medication, etc. India is a country worldwide renowned due to its rich natural resources, biological diversity and cultural heritage (Bisht and Sharma 2005, Singh 2008). Due to its variety of altitudinal zones and long coastlines with various ecological habitats, India has beautiful gift of nature rich in floristic wealth. Though several alternative ways have been ascended along with time, still in

several circumstances the contribution of plants are considered inevitable like in medication. Still as the primary health care traditional herbal remedies are recognized by the rural and tribal communities of the world (Taylor et al. 1995, Singh 2008). As per estimation of World Health Organization, 80 % of world's population for primary health care relies mainly on herbal medicines (Farnsworth 1994, Mukherjee and Wahil 2006, Singh 2008). Medicinal plants are supposed to be possible link between sustainable economic development, affordable health care and conservation of the biodiversity (Dhar et

al. 2002). Worldwide more than 50,000 plants are under use for medicinal purposes (Schippmann et al. 2002, Tejesvi and Pirttila 2011), which is 11.85 % of total reported flowering plants from the world (Govaert 2001). In India, about 8000 plant species (44.12 % of total reported higher plants) have been recorded having medicinal values (Kumar and Katakam 2002, Vidyarthi et al. 2013, Kanwal and Joshi 2015).

The Indian Himalayan Region (IHR), having quite large geographical area, provides the home for 3.8 % of total population of the country (Mukherji 2010) including many tribal and rural communities solely depending upon several plant species to meet the needs of their daily life (Samant and Dhar 1997). The region, being supported by the diverse agro-climatic conditions, turns into a major repository of medicinal as well as aromatic plants. Samant et al. (1998) reported 1748 species of medicinal plants being supported by the region, of which 25.3 % are endemic for Himalaya (Singh 2008). Ved et al. (1998) reported that more than 90 % of medicinal plants of this region are harvested from wild and are used directly or indirectly by the industries (Vidyarthi et al. 2013).

Uttarakhand, one of the states of this region, due to its unique geographical, as well as varied climatic conditions, is well recognized for having rich plant diversity with medicinal value (Gaur 1999, Kala 2004, Kurele et al. 2015). Out of total medicinal plants used in all over India, about 9.33 % medicinal plants are being used in traditional system of medicine only in Uttarakhand state (Kanwal and Joshi 2015).

In recent years, in order to assess both global and local environmental changes, an emphasis has been given to recognition of biological diversity. Climate change, deforestation, overexploitation, globalization,

constructions, growing human population, industrialization, etc. to a great extent have enhanced the threat to biological diversity (Walther et al. 2002, Singh 2008). Currently population deterioration of several high value medicinal plant species (FAO 2003) have been reported as a result of substantial habitat loss due to continuous exploration of medicinal plants from the wild over last few decades (Kala 2003, Singh 2008). In India, 90 % raw materials of medicinal plants for herbal industry is drawn from natural habitat (Gupta et al. 1998, Ved et al. 1998, Singh 2008) and, as per world trade figures in exporting raw material of a number of medicinal plants, India ranks next to China in the world (Lange 1997, Singh 2008). Due to over extraction, different categories of threat have been faced by 14 % of total Red Data plant species and 3.5 % of the total medicinal plants of Indian Himalaya (Singh 2008). Therefore, there is an urgent need to investigate medicinal plants extensively, as well as to document the indigenous practices of medicinal plants systematically in order to check the huge natural population destruction, which is the result of unsustainable and excessive harvesting of medicinal plant resources by the pharmaceutical industries (Behrens 1991, Bodeker 1997, Hamilton 2004, Kurele et al. 2015, Sharma et al. 2012). There is a strong need to set up necessary conservation measure in order to stop the threats (Behrens 1991, Kurele et al. 2015). As in recent years, due to increasing developmental activities and modernization, the over century's developed traditional wisdom is rapidly vanishing (Huntington 1971, Seters 1997). Moreover, the centuries-old traditional knowledge, which was mostly orally transferred from one generation to other without any permanent record, needs to be secured. From this point of view the current study was undertaken in

order to document the present medicinal plant diversity status, as well as the existing traditional knowledge of native people on medicinal plants in this region.

Material and Methods

The present study was conducted as preliminary survey in the villages of Pauri, Rudraprayag and Chamoli districts of Garhwal Himalaya, Uttarakhand, India, viz. Malari, Pipalkoti, Chamoli, Karnprayag, langasu of Chamoli district, Srinagar, Parindic, Chamella, Rera, Juginya, Wadda, Banina, Bandun, Jhangorya, etc. of Pauri district and Thapla, Pabau, Bhaiswara, Rail, Tyori, Bansu, Khumera, Barasu etc. of Rudraprayag district. The study area lies between latitude $29^{\circ}50'30''$ N to $30^{\circ}34'15.7''$ N and longitude $78^{\circ}47'31.6''$ E to $79^{\circ}2'43.9''$ E (Fig. 1). The relevant information and data for study were collected mainly by conducting extensive

and frequent field survey during June to November, 2014, in different villages of the study areas. Interviews were conducted in Hindi and Garhwali (dialect) directly by researcher herself with the presence of one local fellow with the full consent of the respondent. However, some information (origin/nativity and botanical name) also has been collected from secondary sources available in publications and reports of various academic institutions. The altitudinal range of study area was between 500 m to 3500 m above sea level. In the surveyed area mainly four ethnic groups are presented viz. Rajput, Brahmin, Tribal and Schedule caste. In this area people communicate mainly with the help of Garhwali and Hindi. Main sources of income here are agriculture, wage labour and different jobs (governmental and private). Detail information on medicinal plants, including both plant parts used in several medicinal practice and related indigenous knowledge, were

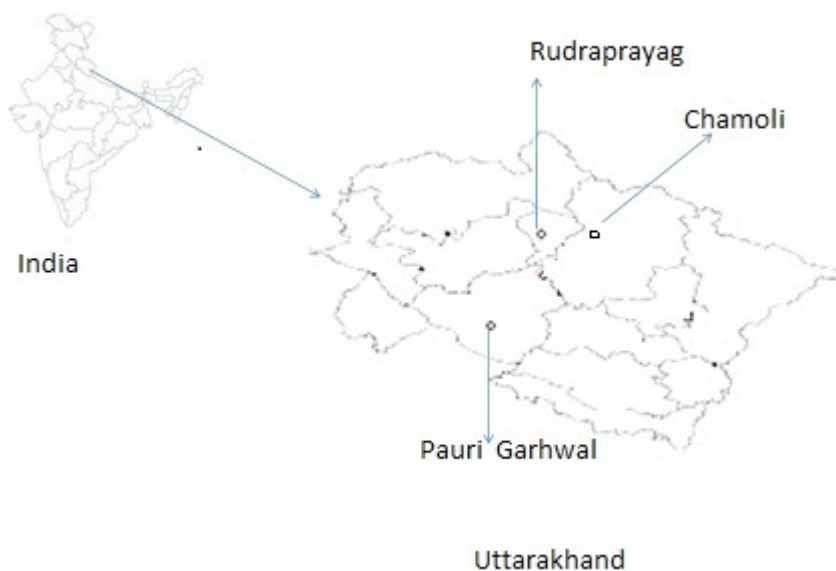


Fig. 1. Map of the study area.

collected by interviewing local habitants of the study area, mainly elderly and knowledgeable persons.

The respondents are of varying age, i.e. starting from 19 to 85. They have various education levels, i.e. from illiterate to higher education (master's level). Most of respondents are engaged in several occupations like education, agriculture, wage labour, job, business, etc. However, some respondents are engaged in Ayurveda treatment of villagers by using medicinal plants and the rest, due to their old age (≤ 80), do nothing. Consultations with traditional healer/vidya also were done to know the additional medicinal properties, uses of plant species and finally existing literature were consulted in order to correct the collected information, as well as to know the vernacular/local name of the used species (Samant et al. 1998, Kala 2004).

Result and Discussion

Total 50 species were identified and recorded in the current study, which belongs to 28 families (Fig. 2). Maximum number of species has been re-

corded in the family Asteraceae and Lamiaceae (4 spp. each), followed by Ranunculaceae, Polygonaceae, Liliaceae, Rosaceae, Solanaceae and Pinaceae (3 spp. each), Achyranthaceae, Anacardiaceae, Apiaceae, Berberidaceae, Caesalpiniaceae, Ericaceae, Liliaceae, Linaceae, Meliaceae, Moraceae, Scrophulariaceae and Solanaceae (2 spp. each). The notable important species were *Centella asiatica*, *Angelica glauca*, *Saussurea obvalata*, *Tinospora sinensis*, *Nardostachys grandiflora*, *Sinopodophyllum hexandrum*, *Mentha longifolia*, etc. (Table 1).

Local village dwellers use several parts of plant species to prepare herbal medicine. In medicine preparation, mostly roots (34.85 %) are used, followed by leaves (27.27 %), whole plants (25.76 %), bark (16.67 %), stem (12.12 %), flower (9.09 %), fruit (9.09 %), seed (6.06 %), resin (4.55 %) and rhizome (1.52 %) of the plant (Fig. 3). Village dwellers use those medicinal plants to cure several common diseases like cough, cold, fever, urinary disorder, skin disease, wounds, sore, eye inflammation, diarrhoea, kidney stone, diabetes, toothache, stomach ache,

Table 1. Details of available medicinal plants in study area

Family	Botanical name	Local Name	Part/s used	Use	Life form	Origin/ Nativity
Acanthaceae	<i>Adhadota vasica</i> Nees.	Basinga	Leaf	Cough, cold and fever	Shrub	Tropical Asia
Achyranthaceae	<i>Achyranthes aspera</i> Linn.	Latjira	Whole plant	Ring worm, facilitating delivery, toothache, asthma, boils, bronchitis, dropsy, colic, cough, cold, dog bite, dysentery, headache, renal complaints, pneumonia, leucoderma, snake and scorpion bite	Herb	Tropical Gerontia

Anacardiaceae	<i>Spondias pinnata</i> (L.f.) Kerz	Amra	Fruit, Bark, Root	Stomach ache, dysentery, diarrhoea, articular and muscular rheumatism, gonorrhoea, menstrual regulation, dyspepsia, sore throat, bowels and ear complaints	Tree	Tropical Asia
	<i>Rhus javanica</i> L.	Tungla	Fruit	Gastric complaints and body swelling	Tree	Himalayan region, Sandwich
Apiaceae	<i>Angelica glauca</i> Edgew	Choru, Chora	Root	Gastric trouble, flatulence, Swelling, cough, cold, fever	Herb	Himalayan region
	<i>Centella asiatica</i> (L.) Urban	Brahmi	Whole plant	Brain tonic, scleroderma, psoriasis, wounds, skin disease, blood purifier	Herb	Tropical and sub-tropical region
Apocynaceae	<i>Rauvolfia serpentina</i> Benth.	Sarpgandha	Root	Anxiety, Insomnia, high BP, fever, cough, nervous and intestinal disorder	Shrub	Indian Oriental, Java
Araceae	<i>Arisaema jacquemontii</i> Blume	Saperi mausi	Root, Fruit	Antidote for snake bite	Herb	Himalayan region
	<i>Artemisia vulgaris</i> L.	Kunja	Whole plant	Malarial fever, headache, cuts, wounds and ear complaints	Shrub	Temperate region, Borealis
	<i>Artemisia capilaris</i> Thunb	Pati	Leaf	Ear complaints, tonic for worms	Herb	Japan
Asteraceae	<i>Saussurea costus</i> (Falc.) Lipsch	Koot	Root	snake bite, jaundice, toothache and gum complaints	Herb	Himalayan region
	<i>Taraxacum officinalis</i> Weber. Dudhar	Kanphul	Whole plant	Rheumatism, kidney and liver trouble, mouth ulcer, blisters, boils, diabetes, burnt body parts, blood purifier	Herb	Temperate region, Borealis, Australia
	<i>Berberis aristata</i> DC	Chatru	Root, Bark	Anticancer, snake and rodent bite, ulcer and eye complaints	Shrub	Indian Oriental
Berberidaceae	<i>Berberis lycium</i> Royle	Kilmora	Root, Bark, Stem, Fruit	Diabetes, piles, skin disease, eye and ear complaints	Shrub	Himalayan region
	<i>Sinopodophyllum hexandrum</i> (Royle) T.S.Ying	Bankakri	Root	Cancer, asthma, constipation, blood purifier, skin disease, cut and wounds	Herb	Himalayan region
Betulaceae	<i>Betula utilis</i> D.Don	Bhojpatra	Bark, Leaf	Fever, nose bleeding, cough, cold, rheumatism	Tree	Himalayan region, Japan

Caesalpiniaceae	<i>Bahunia variegata</i> L.	Guriyal	Bark, Stem, Flower	Cough, boils, skin disease, dysentery	Tree	Indian Oriental, Burma, China
	<i>Cassia tora</i> L.	Chakunda	Leaf, Root, Fruit	Stomach ache, cough, cold	Herb	Tropical Cosmopolitan
Cannabaceae	<i>Cannabis sativa</i> L.	Bhang	Leaf, Seed, Flower	Ulcer, bronchitis, cuts, fever, sedative	Shrub	Central Asia
Chenopodiaceae	<i>Chenopodium album</i> L.	Bathua	Seed, Leaf	Skin disease	Herb	Temperate and Tropical region
Cuscutaceae	<i>Cuscuta reflexa</i> L.	Amer bel	Whole plant	Inflammation, swelling, rheumatic pain, skin disease	Herb	Indian Oriental
Ericaceae	<i>Lyonia ovalifolia</i> (Wall.) Drude	Anyar	Whole plant	Ulcer, cut, itching	Tree	Himalayan region, Japan
	<i>Rhododendron arboreum</i> Sm	Burans	Flower, Leaf	Heart tonic, dysentery, digestive, blood pressure, fever, headache, rheumatism	Tree	Himalayan region, Indian Oriental
Euphorbiaceae	<i>Emblica officinalis</i> Gaertn.	Amla	Whole plant	Stomach-ache, blood purifier, source of vitamin C, hair tonic, digestive	Tree	tropical Asia
Fabaceae	<i>Astragalus condolleanus</i> Royle ex Benth	Rudravanti	Root	Skin complaints, blood purifier	Herb	Persia
Gentianaceae	<i>Swertia angustifolia</i> Buch.-Ham. ex D. Don	Chirotu	Whole plant	Fever, malarial fever, blood purification	Herb	Himalayan region
Juglandaceae	<i>Juglans regia</i> L.	Akhrot	Bark, Leaf, Fruit	Rheumatism, toothache, eczema, swelling in between two fingers, leaf used as insecticide and fungicide	Tree	Asia, Occidentalis, Himalayan region
Lamiaceae	<i>Leucas cephalotes</i> Roth Sreng.	Gumba	Whole plant	cut, pain and snake bite	Herb	Indian Oriental
	<i>Mentha longifolia</i> L.	Pudina	Whole plant	Digestive, stomach-problems, indigestion	Herb	Borealis Temperate region
	<i>Ajuga parviflora</i> Benth.	Neelkanthi	Whole plant	Stomach ache, malaria	Herb	Himalayan region
	<i>Origanum vulgare</i> L.	Bantulsi	Whole plant	Whooping cough, bronchitis, diarrhoea, cough and cold	Herb	Europe, Asia and Africa Tropical
Lauraceae	<i>Litsea glutinosa</i> (Lour.) Robins	Maida lakri	Bark	Bone fracture, joint pain reliever	Tree	Himalayan region

Liliaceae	<i>Allium stracheyi</i> Baker	Jambu	Leaf	indigestion, stomach-complaints, flatulence	Herb	Himalayan region
	<i>Gloriosa superba</i> L.	Kali hari	Root, Leaf	Skin disorder, painful delivery	Herb	Asia Tropical
	<i>Asparagus racemosus</i> Wild.	Sataver, Jhirna	Root	Urinary complaints	Shrub	Indian oriental, African tropical, Australia
Linaceae	<i>Reinwardtia indica</i> Dumort	Phinuli	Leaf, Flower	Wounds, cut, paralysis	Herb	Indian Oriental
Meliaceae	<i>Azadirachta indica</i> Juss.	Neem	Stem, Leaf, Flower	Skin disease, antiseptic, toothache, diabetes	Tree	Indian Oriental
	<i>Toona ciliata</i> M. Roem.	Toon	Leaf, Stem	Ulcers, sore	Tree	Australia
Menispermaceae	<i>Tinospora cordifolia</i> (Willd.) Miers	Giloe	Leaf, Stem	Fever, leprosy, urinary complaints of domestic animal	Herb	Indian Oriental
Moraceae	<i>Ficus palmata</i> Forsk	Bedu	Fruit, Leaf	Indigestion, dysentery	Tree	Africa Tropical Arabia Indian Oriental
	<i>Ficus religiosa</i> L.	Pipal	Stem, Bark	Swelling, rheumatism, bronchitis	Tree	Indian oriental
Myricaceae	<i>Myrica esculenta</i> Buch. -Ham ex Don	Kaphal	Bark	Fever, headache	Tree	Asia tropical and sub-tropical
Myrtaceae	<i>Syzygium cumini</i> (L.) Skeels	Jamun	Whole plant	Kidney stone, diabetes	Tree	Asia and Australia Tropical
Orchidaceae	<i>Dactylorrhiza hatagirea</i> (D.Don) Soo	Hatajari	Root	Impotency, leucorrhoea, diarrhoea, kidney pain, cut, wounds	Herb	
Oxalidaceae	<i>Oxalis corniculata</i> L.	Khattibuti	Whole plant	Jaundice, insect bite, skin complaints, pimple, indigestion, cut, wound, cough, cold	Herb	Amphigaea Temperate and Tropical
Pinaceae	<i>Cedrus deodara</i> (Roxb.) Loud	Deodar	Resin, Stem	Joint pain and joint stiffness, piles, skin Itching, boils	Tree	Himalayan region
	<i>Pinus roxburghii</i> Sarg.	Chir	Resin, Stem	Asthma, bronchitis, bone fracture, skin disease, ulcer	Tree	Himalayan region
	<i>Pinus wallichiana</i> A.B. Jacks	Kail	Resin, Bark	Ulcer, joint pain, dislocation joints	Tree	Himalayan region
Plantaginaceae	<i>Plantago depressa</i> Willd.	Isabgol	Leaf, Seed	Piles, gastric, indigestion	Herb	Siber
Poaceae	<i>Cynodon dactylon</i> (L.) Pers	Dub	Whole plant	Headache, nose bleeding, dysentery, cramps, cut, puking	Herb	Cosmopolitan Tropical

Polygonaceae	<i>Rumex hastatus</i> D. Don	Almora	Whole plant	Skin complaints, cut and wounds	Herb	Himalayan region
	<i>Fagopyrum dibotrys</i> (Don) Hara	Bathu	Root	Insect bite, vermicide	Herb	Himalayan region, China
	<i>Rheum australe</i> D. Don	Dolu	Root	Bone ache, joint pain, muscular pain, internal wound	Herb	Himalayan region
Ranunculaceae	<i>Aconitum ferox</i> Wall.	Meetha bish	Root	Paralysis, joint pain, arthritis, fever	Herb	Himalayan region
	<i>Aconitum heterophyllum</i> Wall.	Ateesh	Root	Typhoid, tuberculosis, diarrhoea, fever, body pain, cough, gastric trouble	Herb	Himalayan region
	<i>Thalictrum foliosum</i> DC.	Mamiri Or makhan ghas	Root	Fever, stomach ache, eye sore	Herb	Himalayan region
Rosaceae	<i>Rosa macrophylla</i> Lindl.	Ban gulab	Flower	Bowel complaints, cut, wound, skin disease	Shrub	Himalayan region, China
	<i>Potentilla fulgens</i> Hook.	Bajradanti	Root	Pyorrhoea, gum trouble and toothache	Herb	Himalayan region
	<i>Rubus ellipticus</i> Sm.	Hinsar	Shoot, Root	Stomach complaints, skin disease, dysentery	Shrub	Indian oriental
Saxifragaceae	<i>Bergenia ligulata</i> Engl.	Silphaara	Root	Kidney stone, indigestion, swellings, diabetes	Herb	Himalayan region
Scrophulariaceae	<i>Picrorhiza kurrooa</i> Royle	Kutki	Root	Jaundice, fever, stomach complaints, laxative, dysentery, cold	Herb	Himalayan region
Solanaceae	<i>Withania somnifera</i> Dunal	Ashwagandha	Root	Fever, joint pain, urinary complaints	Shrub	Regional Mediterranean
	<i>Solanum nigrum</i> L.	Makoi	Whole plant	Liver complaints, jaundice, diarrhoea, eye complaints, fever	Herb	Venezuela
	<i>Datura stramonium</i> L.	Datura	Leaf, seed	Asthma, bronchitis, joint pain, stomach ache, cough	Herb	Indian Oriental
Taxaceae	<i>Taxus baccata</i> L.	Thuner	Bark, Leaf	Cancer, bone fracture, cough, cold	Tree	Regional Borealis temperate
Zingiberaceae	<i>Hedychium spicatum</i> Buch.-Ham ex Sm.	Banhaldi	Rhizome	Asthma, tuberculosis, cough, cold, menstrual pain, indigestion	Herb	Himalayan region

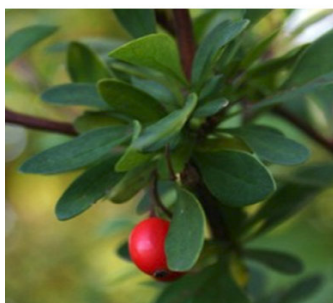
N.B. Botanical name and origin/nativity have been collected by reviewing literatures.



Achyranthes aspera



Saussurea costus



Berberis aristata



Rhus javanica



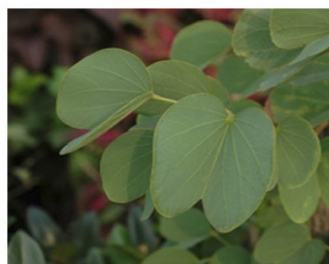
Artemisia vulgaris



Angelica glauca



Artemisia capilaris



Bahunia variegata

Fig. 2. Some of important medicinal species found in study area.

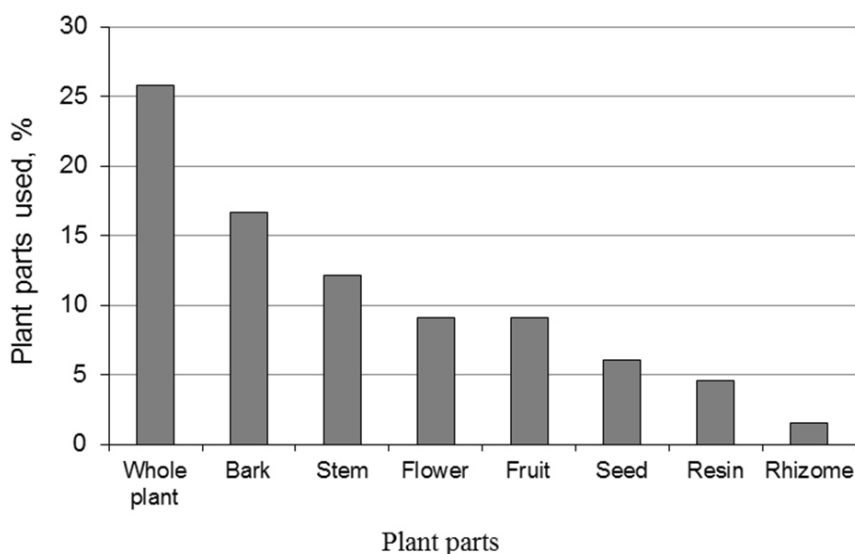


Fig. 3. Percentage of plant parts used in medicine preparation purpose.

indigestion, headache, swelling, body pain, joint complaints, gastric trouble, etc. Among the listed plants, *Allium stracheyi* and *Picrorhiza kurroo* have been recorded under vulnerable threat category in the Red Data Book of Indian plants.

According to CAMP-2003 criteria, among the listed species *Aconitum heterophyllum*, *Dactylorhiza hatagirea* and *Picrorhiza kurroo* have been recorded under the category critically endangered; *Saussurea obvallata*, *Sinopodophyllum hexandrum* and *Angelica glauca* have been categorized as endangered species. *Allium stracheyi*, *Gloriosa superba* have been placed under vulnerable category. As per IUCN status, *Dactylorhiza hatagirea* has been categorized as endangered species.

Aconitum ferox, *Angelica glauca* and *Allium stracheyi* are identified as endemic species, which are restricted to Indian Himalayan Region. On the other hand, *Aconitum heterophyllum*, *Arisaema jac-*

quemontii, *Arnebia benthami*, *Berberis aristata*, *B. lycium*, *Dactylorhiza hatagirea*, *Rheum australe*, *Potentilla fulgens*, *Bergenia ligulata* and *Hedychium spicatum* are restricted to Indian Himalayan region and neighbouring Himalayan countries and so they have been brought under category near endemics.

The study shows that inhabitants have pretty much idea regarding medicinal plants and their uses in curing several diseases. Belief on treatment by using medicinal plants varies based on types of area, i.e. whether it is village or town. In village, 70.27 % respondents have belief in medicinal plant use but only 48.23 % respondents in town showed interest in use of medicinal plants in treatment (Fig. 4). Moreover, belief on medicinal plants also varies with the age of respondents. In this study, 69.38 % old respondents believe in medicinal plant use, whereas it is only 46.57 % in the case of young respondents (Fig. 5). Evidently, study shows that

77.45 % old respondents (age ≥ 40) in village and 55.17 % in town believe in effect of medicinal plants. In village 54.34 % and only 33.33 % young respondents in town believe in usefulness of medicinal plants (Fig. 6). In several villages dwellers are forced to use traditional medicines due to remoteness and inconvenience to avail modern medicinal facilities. In the study area, based on distance from main road, use or believe on medicinal plant and its use in treatment also differ. Study shows that 70.09 % old respondents and 50.84 % young respondents, who live away from the road, believe on use of medicinal plants in treatment, whereas the belief is 67.44 % in case of old and only 28.57 % for young respondents who live near the main road and can avail the

modern medicinal facilities (Fig. 7). Belief on use of medicinal plants also depends on caste. In the study area, 61.53 % Brahmin, 62.24 % Rajput, 62.66 % SC and 50 % ST respondents believed in medicinal plants use (Fig. 8). Only few people have drastic knowledge regarding medicinal plants and their implement in important complicated disease like cataract, cancer, kidney stone, snake bite, asthma, piles, etc. Presently the study shows that this knowledge is being depleted day by day due to migration of village dwellers to urban areas seeking for better livelihood, lack of interest of youth generation on traditional medicine and its uses as they think that it is time consuming procedure than modern medicinal facilities (Fig. 6 and 7).

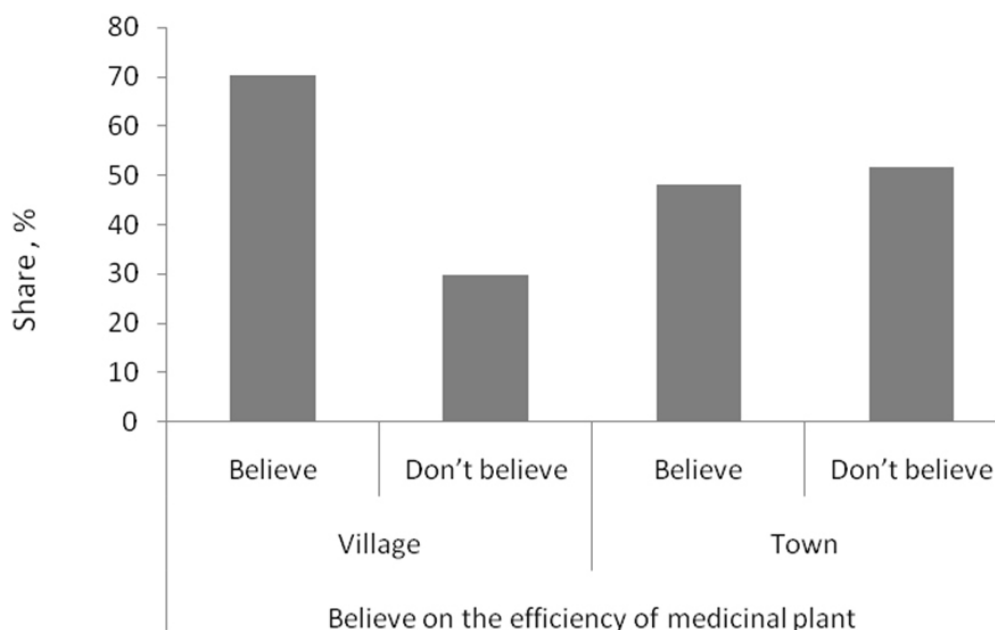


Fig. 4. Share of belief on the efficiency of medicinal plants based on type of area.

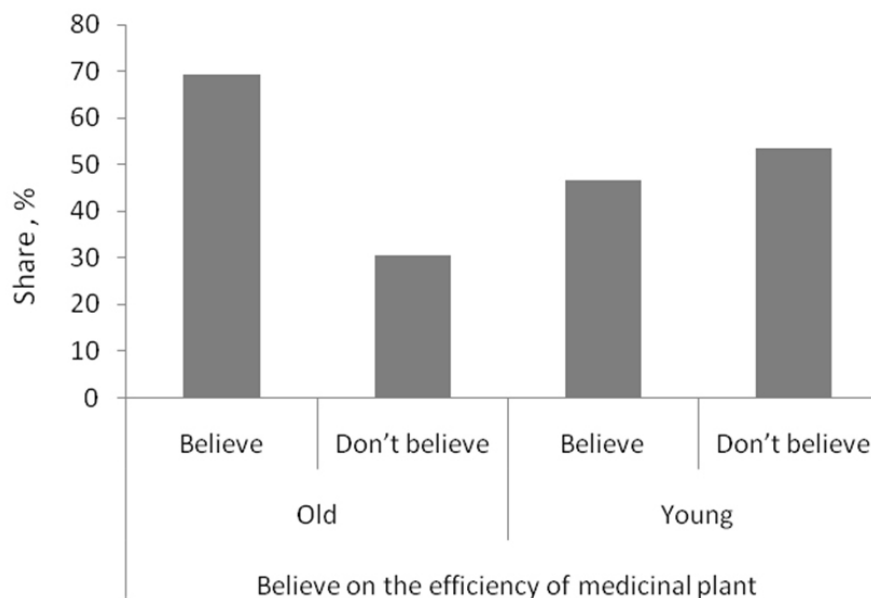


Fig. 5. Share of belief on the efficiency of medicinal plants based on age group.

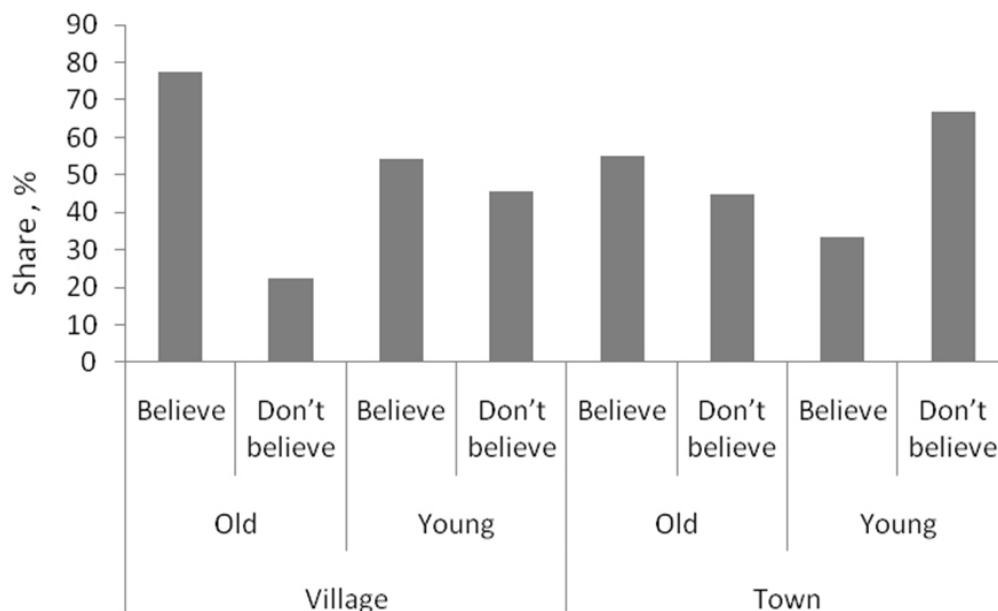


Fig. 6. Share of belief on the efficiency of medicinal plants based on type of area and age group.

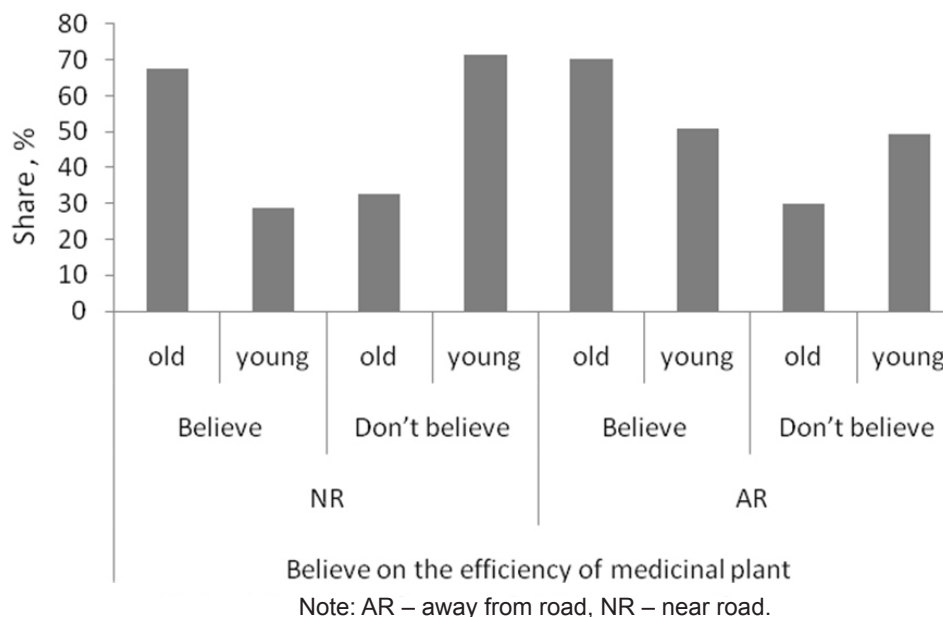
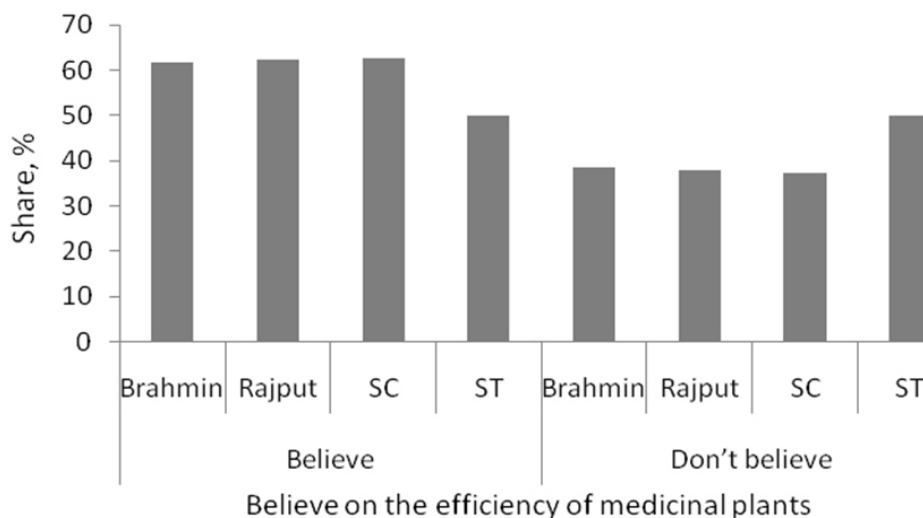


Fig. 7. Share of belief on the efficiency of medicinal plants based on distance from main road and age group.



Note: SC – schedule caste, ST – schedule tribe.

Fig. 8. Share of belief on the efficiency of medicinal plants based on castes.

Conclusion

It is worth to notify that the knowledge is being depleted day by day due to migration of village dwellers to urban areas seeking for better livelihood, lack of interest of youth generation on traditional medicine and its uses as they think that it is time consuming procedure than modern medicinal facilities. Hence, there is an urgent requirement of available indigenous knowledge documentation has been felt strongly to save all those important knowledge. Tafesse and Mekonnen (2001) and Regassa (2013) also mentioned the facts stated above as the reason of knowledge depletion. Giday et al. (2009) also mentioned that acculturation of young generation is one of the major threat to the continuation of traditional medicinal knowledge.

Moreover, medicinal plants are continuously exploited unsustainably. Egharevba et al. (2015) also reported the fact. Same statement has been given in the report of planning commission (2000) Govt. of India and Sharma et al. (2012). This fact, together with anthropogenic pressure, climate change, habitat degradation becomes the reason of rapid depletion of several important medicinal plants (Kanwal and Joshi 2015). In present study area such threats have been faced by *Acronitum heterphyllum*, *Arnebia benthami*, *Dactylorhiza hatagirea*, *Picrorhiza kurroa*, *Angelica glauca*, *Sinopodophyllum hexandrum*, *Allium stracheyi*, *Gloriosa superba* etc. Therefore, there is an urgent requirement of documentation of all available indigenous knowledge (WHO, IUCN & WWF 1993).

Only in this way we can save all those important knowledge to let people know about the importance of plants in curing difficult diseases, as well as to conserve those plants facing threats by forming

strong management strategies. For this reason, a suitable conservation planning is strongly required including advance biomedical research, transfer of technology to local communities for the sake of proper sustainable harvest of existing medicinal plants, organization of educational and awareness programmes among local communities to encourage them in conservation of medicinal plants. Same also has been recommended in the report of planning commission (2000), Govt. of India.

Finally, based on this, a comprehensive and long term conservation and management of all existing medicinal plant species is also essential. Same also has been advised in the report of planning commission (2000), Govt. of India. All of them could be achieved by involving several stakeholders for the wellbeing and well management of the huge medicinal treasure of this area but most important part is, the ecosystem needs to be preserved in its intact form and so the area must be conserved locally by the name of sacred grove, which is community based forest protection and proved to be quite strong way in order to give complete protection to the productive ecosystem, which is also very prominent in the study area. Kurela (2015) also mentioned about sacred grove concept in the context of protection for the ecosystem.

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