

Plants utilization by the communities of Bharsar and adjoining area of Pauri Garhwal District, Uttarakhand, India

ANAND S. BISHT[✉], K.D. SHARMA

Department of Molecular Biology and Biotechnology, Uttarakhand University of Horticulture and Forestry, Bharsar-246123, Pauri Garhwal, Uttarakhand, India. Tel.: +91-1348-226070, 226059, Fax.: + 91-1348-226058, ✉email: drbishtas@gmail.com

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ABSTRACT

Bisht AS, Sharma KD. 2014. Plants utilization by the communities of Bharsar and adjoining area of Pauri Garhwal District, Uttarakhand, India. Biodiversitas 15: 94-100. Garhwal Himalaya possesses luxuriant a varied vegetation with in the Himalaya region. Almost every plant has economic value in the form of shelter, food, water, medicine, fuel and industrial products and fodder. Surveys were conducted in entire Bharsar, Pauri Garhwal district of Uttarakhand, India in order to get information on traditional uses of plants by local inhabitants. A total of 138 plants were collected that some species had more than one function of which 39 species of vegetables, 28 species of medicinal plants, 19 species of fruits, 18 species of ornamental flowers, 12 species of forest plants, 7 species of agroforestry and social forestry, 8 species of spices and condiments, 6 species of minor cereal crop plants, 5 species of pulses, and 4 species of oil seed plants were found economically important as they are used by the people frequently for various purposes.

Key words: Garhwal Himalaya, forestry, medicine, plant genetic resources, vegetables

INTRODUCTION

The Himalaya is the perennial source of attractions, curiosity and challenge to human intellect through the ages. Amongst several assets, the vegetation provides an everlasting and interesting field of investigation. The diversity, copiousness as well as uniqueness of the plant components in various habitats retained sound and aesthetic environment of the Himalaya. However, in the recent past couple of years, excessive exploitation of vegetation, unplanned land use, natural disasters and several developmental processes, accelerated deterioration of vegetation or loss of individual species since we do not possess the detailed botanical record for several of the localities or region. One of such botanical interests and little known region is the Bharsar in district Pauri, which sustain unique and rich genetic resources.

Plant genetic resources continue to play an important role in the development of agriculture, horticulture, forestry etc. World population is expected to increase from 7.0 billion to 9.1 billion by 2050 (UN News Center 24/02/2005). The world needs astonishing increase in food production to feed this population. Plant genetic resources, constitutes the foundation upon which agriculture and world food securities are based and the genetic diversity in the germplasm collection is critical to the world's fights against hunger. They are the raw material for breeding new plant varieties and are a reservoir of genetic diversity.

In view with the multiple stresses and depletion of genetic resources and habitat, today's foremost concern of the globe in general and Himalayas in particular is the conservation of biological diversity, for which detailed

description of plant genetic entities are essential. Keeping in view (i) the lack of earlier record, (ii) diversity and richness of the genetic resources in vast and varied stretch of land, (iii) the deterioration of mountain ecosystem and (iv) present day concern of biodiversity. An attempt is made to present the genetic resources account of the Bharsar region of district Pauri Garhwal, Uttarakhand.

MATERIALS AND METHODS

Study area

Pauri Garhwal is one of the thirteen districts of Uttarakhand, India and is located between 29° 20'-29° 75' N latitude and 78° 10'-78° 80' E longitude, covering about 5540 km² area. The district is the most fascinating segments of Himalaya, stretches from the Ram Ganga river that separates Pauri-Kumaon border in the East, and to the Ganga demarcating the Western border. Almora, Nainital (East), Chamoli, Tehri and Dehradun (North-West) and adjacent plains of Bijnor, Hardwar (South) districts, surround it. The whole area lies in between Kumaon and Himachal Pradesh Himalaya and considered as a part of North-Western Himalaya.

Bharsar is situated at about 60 km from the district head quarter (Pauri) in the East-South direction on the road side area of Pauri-Thalisain-Ram Nagar National Highway 121/41. The meaning of Bharsar in local dialect is 'flourished with natural wealth'. Since the ancient time, it is famous for its vast reserve of biodiversity and geographically the temperate climate conditions of the region are quite congenial for the horticulture. It is bounded

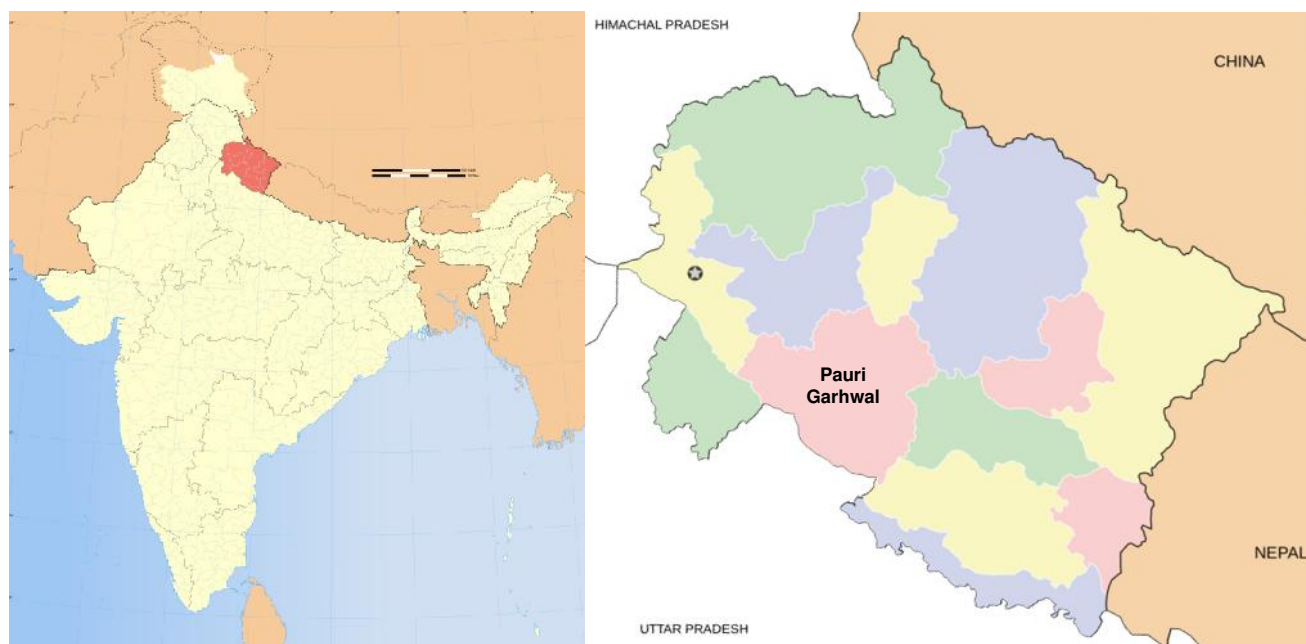


Figure 1. Study site in Pauri Garhwal district of Uttarakhand, India.

by the temperate evergreen forest towards North-East (Budha Bharsar), North-West (Chauri Khal), East-South direction occupies terracing crop fields and village namely Dhulet, Sakniyana, Buransi, Nauntha, Sainji, etc.

Climate

In general, the climate of the Bharsar represents the mild summer, higher precipitation and colder or severe cold prolonged winter. The climate factors i.e. precipitation, temperature, relative humidity and wind, in association with elevation (valleys or mountain range from temperate zone), proximity to Great Himalaya, slope aspects, drainage, vegetation etc are responsible for the micro-climate of this area. Major output of precipitation is in the form of rain fall, besides occasional occurrence of due, hailstorm, fog, frost, snow fall etc. The South-East monsoon commences towards the end of June while the North-East monsoon causes occasional winter showers during November-February. During winter, snow fall is common in this region. During summer months, the valley has hot climate prevailing for few hours in a day, the maximum temperature during May-June is recorded between 30°C-35°C however, and nights are cool. December and January are the coldest months, the minimum temperature reaches to 1°C to -4°C. Relative humidity is normally highest during rainy season (July - August), often recorded near to saturation point (92-97%) in thickly forest in this zone, it gradually decreases towards December (Patak 1991; Negi 1995).

Soil

The soil texture, color and nature represent wide range of variations, depending upon geology, altitude, slope aspects, climate, vegetation and biological and chemical interactions. In general, the soil of the Himalaya on the

slopes about 30° represents thin surface horizon. Such skeletal soil has medium to coarse texture, depending the core materials. The valley and gentle slopes have considerable soil depth, developed from colluviums the texture of such soil is generally coarse and least acidic. Decrease in soil pH with increase of elevation has been reported by some workers, possibly due to leaching out of calcium and magnesium from the surface and simultaneously in much higher altitude of great Himalaya, the trend is reversed. In majority of the places soil is rich in potassium, medium in phosphorous and poor in nitrogen contents, with the exception of some cultigens fields (Patak 1991; Kolay 2007).

Procedures

The present investigation was a result of extensive and intensive field survey, conducted during August 2012 to July 2013. The specimen were collected by usual methods of collection, preservation and maintenance of specimen in herbarium with field notes viz. local name, habit, habitat, altitude range, color of flower, flowering and fruiting time, general availability, local use etc. The collected specimens were identified with the help of recent and relevant floras i.e. Gaur (1999) and Naithani (1984, 1985) various plant species have been gathered through personal interview of the local inhabitants.

RESULTS AND DISCUSSION

After extensive surveys conducted during 2011-2014 in Bharsar, Pauri district of Garhwal Himalaya, a total of 169 species collected and these species were recorded as economically important species based on genetic resource knowledge exists in the district. Species were further

Table 1. Enumeration of useful plants of Bharsar, Pauri district of Garhwal Himalaya, Uttarakhand, India

Botanical name	Family	English name	Vernacular name	Varieties
Vegetables				
<i>Abelmoschus esculentus</i>	Malvaceae	Lady's finger	Bhindi	Anamika, Pusa Sawani, Pusa Makhmali, Kiran, Aruna.
<i>Beta vulgaris</i>	Chenopodiaceae	Chukander	Sugar beet	Early Wonder', 'Detroit Dark Red', 'Ruby Queen', and 'Crosby'
<i>Brassica chinensis</i>	Brassicaceae	Chinese cabbage	Pakchoi	Baby, Shanghai
<i>Brassica oleracea</i> var. <i>capitata</i>	Brassicaceae	Cabbage	Bandh gobhi	Savoy, Napa, Navkranti, Pride of India
<i>Brassica rapa</i>	Brassicaceae	Turnip	Shalgham	
<i>Capsicum annuum</i>	Solanaceae	Capsicum	Simla mirch	California Wonder, Yellow Wonder, Nishant, Ganga, Bharat, Indira
<i>Colocasia esculenta</i>	Araceae	Taro	Arvi	
<i>Colocasia himalayensis</i>	Araceae	-	Pindalu	
<i>Cucumis sativus</i>	Cucurbitaceae	Cucumber	Kheera	Balam Kheera, Pant Khera, Sheetal, Kalyanpur Green, Aman, Himagi
<i>Cucurbita moschata</i>	Cucurbitaceae	Pumpkin	Kaddu	
<i>Cucurbita maxima</i>	Cucurbitaceae	Red gourd	Metha Kaddu	
<i>Cucurbita pepo</i>	Cucurbitaceae	Field pumpkin	Chhappan Kaddu	Australian Green. Panjab Chhappan Kaddu-1, Early Yellow
<i>Daucus carota</i>	Apiaceae	Carrot	Gajar	Nantes (European carrot), RKC 1 to 6, Pusa Keshar, Pusa Medhali
<i>Lablab purpureus</i>	Fabaceae	Lablab bean	Patiya Sem	Pant Bean-2, Pusa Parvati, Pusa Himgiri, ABM-1
<i>Lactuca sativa</i>	Asteraceae	Lettuce	Salad, loki	
<i>Luffa acutangula</i>	Cucurbitaceae	Ridge gourd	Kali tori	
<i>Luffa cylindrica</i>	Cucurbitaceae	Sponge gourd	Ghiya tori,	
<i>Lycopersicon esculentum</i>	Solanaceae	Tomato	Tamatar	HS-101, Sweet-72, Pusa Hybrid-1 & 2, Pant Bahar, Pusa Divya, Arka Vishal, Manisha, Kashi, Amrit Rupali, GS-600
<i>Momordica charantia</i>	Cucurbitaceae	Bitter gourd	Karela	
<i>Phaseolus vulgaris</i>	Fabaceae	Common bean	Sem	Bharsar Local
<i>Pisum sativum</i>	Fabaceae	Pea	Matar	Arkel, PB-89, Pant Uphar, Ajad Matar, Pant Sabji Matar-3
<i>Raphanus sativus</i>	Brassicaceae	Radish	Muli	Doonagiri, Bharsar Local, BM 1-18, Japonica White. Punjab Pasand, Kashi Shrota
<i>Solanum melongena</i>	Solanaceae	Brinjal	Baingan	Bharsar Nav kiran, BPL-74, Pant Samrat, Pant Rhituraj, Pusa Utam, Pusa Upkar
<i>Solanum tuberosum</i>	Solanaceae	Potato	Aloo	Kufri Chandarmukhi, Kufri Ashoka, Kufri Jawahar, Chip Sona-1, Chip Sona-2
<i>Spinacia oleracea</i>	Chenopodiaceae	Spinach	Palak	BG, PH, Local, Algreen, Pusa Jyoti
<i>Trichosanthes anguina</i>	Cucurbitaceae	Snake gourd	Chachinda	
<i>Trigonella foenum-graecum</i>			Methi	TG-74, Kasoori Maithi, Maithi Local, Pant Ragni
Naturally occurring vegetables				
<i>Abelmoschus ficulneus</i>	Malvaceae	Lady's finger	Jangali bhindi	
<i>Amaranthus dubius</i>	Amaranthaceae	Amaranthus	-	
<i>Amaranthus viridis</i>	Amaranthaceae	Amaranthus	Jangli chaulai	
<i>Bauhinia variegata</i>	Fabaceae	Mountain ebony	Kachnar	
<i>Chenopodium album</i>	Amaranthaceae	Lamb's-quarters	Bathua	
<i>Diplazium polypodioides</i>	Athyriaceae	-	Lingura	
<i>Dioscorea belophylla</i>	Dioscoreaceae	Asiatic yam eng	Tarur	
<i>Ficus auriculata</i>	Moraceae	Roxburgh fig	Timla	
<i>Momordica balsamina</i>	Cucurbitaceae	Bitter gourd	Ban Kokora	
<i>Oxalis corniculata</i>	Oxalidaceae	Creeping woodsorrel	Kati Booti	
<i>Urtica dioica</i>	Urticaceae	Stinging nettle	Bichhu Buti	
<i>Zehneria umbellata</i>	Cucurbitaceae	-	Gwal Kakri	
Spices and condiments				
<i>Allium cepa</i>	Amaryllidaceae	Onion	Pyaz	Nasik Red, Pusa Ratna, Punjab Red Round, Arka Kirtiman, Arka Lalima, VL Onion-3
<i>Allium sativum</i>	Amaryllidaceae	Garlic	Lahsun	Jamuna Safed-1, Jamuna Safed-3, Pant Lohit
<i>Amomum subulatum</i>	Zingiberaceae	Cardamom	Bari Elachi	
<i>Capsicum annuum</i> var. <i>frutescens</i>	Solanaceae	Chill	Mirch	Pant C-1, Pusa Sadabahar, Punjab Lal

<i>Coriandrum sativum</i>	Apiaceae	Coriander	Dhania	
<i>Curcuma domestica</i>	Zingiberaceae	Turmeric	Haldi	
<i>Mentha arvensis</i>	Lamiaceae	Mint	Paudina	
<i>Zingiber officinale</i>	Zingiberaceae	Ginger;	Adrak	
Fruits				
<i>Actinidia arguta</i>	Actinidiaceae	Kiwifruit	Kiwi	
<i>Castanea sativa</i>	Fagaceae	Chestnut	Chestnut	
<i>Citrus aurantifolia</i>	Rutaceae	Lime	Kagzinimbu	
<i>Corylus jacquemontii</i>	Corylaceae	Turkish hazelnut	Bhotiya Badam	
<i>Juglans regia</i>	Juglandaceae	Walnut	Akhrot	Govind, Rupa, Pratap
<i>Malus domestica</i>	Rosaceae	Apple	Seb	Golden Delicious, Vance Delicious, Red Chief, Oregon Spur, Royal Delicious, Top Red, Choubatiya Anupum, Rome Beauty Sharbati, Early Cream. Red June, Red Heaven, Early Glow, July Elberta
<i>Prunus persica</i>	Rosaceae	Peach	Aru	Moorpark, Turkey, St. Ambrose, Kaisha, Nugget
<i>Prunus armeniaca</i>	Rosaceae	Apricot	Chulu	Satsuma, Santa Rosa, Burbank, Kelsey, Santa Rosa, Titron, Satsuma, Mariposa, Jamuni, Kelsey, Santa Rosa, Titron Blue Rock, Victoria
<i>Prunus domestica</i>	Rosaceae	Plum	Alubukhara	
<i>Punica granatum</i>	Punicaceae	Pomegranate	Anar	
<i>Pyrus communis</i>	Rosaceae	Pear	Naspati	
Wild edible fruits				
<i>Aesculus indica</i>	Sapindaceae	Indian horse chestnut	-	
<i>Ficus auriculata</i>	Moraceae	Roxburgh fig	Timla	
<i>Ficus palmata</i>	Moraceae	Punjab fig	Bedu	
<i>Myrica esculenta</i>	Myricaceae	Box myrtle	Kaphal	
<i>Pyracantha crenulata</i>	Rosaceae	Nepalese firethorn	Ghingaru	
<i>Rubus fruticosus</i>	Rosaceae	Blackberry	Kathula	
<i>Rubus nepalensis</i>	Rosaceae	Blackberry	Lal hisol	
<i>Rubus niveus</i>	Rosaceae	Mysore raspberry	Kala hissar	
Agroforestry and social forestry				
<i>Bauhinia variegata</i>	Caesalpiniaceae	Mountain Ebony	Guiral, Kuiral	
<i>Celtis australis</i>	Ulmaceae	European Nettle tree	Kharik	
<i>Corylus jacquemontii</i>	Corylaceae	Turkish hazelnut	Bhotiya Badam	
<i>Ficus palmata</i>	Moraceae	Fig	Bedu	
<i>Grewia optiva</i>	Tiliaceae	Grewia	Bhimal	
<i>Morus serrata</i>	Moraceae	Himalayan Mulberry	Keemu, Sehtoot	
<i>Prunus cerasoides</i>	Rosaceae	Wild Cherry	Panyyan	
Ornamental plants				
<i>Bellis perennis</i>	Asteraceae	Daisy		
<i>Calendula officinalis</i>	Asteraceae	Pot Marigold	Marigold	
<i>Celosia cristata</i>	Amaranthaceae	Cocks comb	Sarwari	
<i>Chrysanthemum</i> sp.	Asteraceae	Daisy	Guldawadi	
<i>Columnea crassifolia</i>	Gesneriaceae	Columnea		
<i>Dahlia imperialis</i>	Asteraceae	Dahlia	Dahlia	
<i>Gladiolus gandavensis</i>	Iridaceae	Gladiolus	Gladiolus	
<i>Helenium</i> sp.	Asteraceae	Horse-heal		
<i>Helianthus annuus</i>	Asteraceae	Sun Flower	Surajmukhi	
<i>Hibiscus rosa-sinensis</i>	Malvaceae	China Rose	Gudhal	
<i>Inula ensifolia</i>	Asteraceae	Aster	Aster	
<i>Lavatera trimestris</i>	Malvaceae	Silver Cup	Silver Cup	
<i>Meconopsis cambrica</i>	Papaveraceae	Welsh poppy	Poppy	
<i>Rosa</i> spp.	Rosaceae	Rose	Gulab	
<i>Rosa macrophylla</i>	Rosaceae	Wild Rose	Van-Gulab	
<i>Tagetes</i> sp..	Asteraceae	Marigold	Gainda	
<i>Tropaeolum majus</i>	Tropaeolaceae	Nasturtium		
<i>Zinnia elegans</i>	Asteraceae	Zinnia;	Zinnia	
Medicinal and aromatic plants				
<i>Aconitum heterophyllum</i>	Ranunculaceae	Indian Aconite	Atis	Rhizome*
<i>Acorus calamus</i>	Araceae	Sweet flag	Bach	Rhizome*
<i>Ajuga bracteosa</i>	Lamiaceae	Bugle	Neelkanthi	Leaf*
<i>Aloe vera</i>	Liliaceae	Aloe	Gheet kumari	Leaves*
<i>Artemisia nilagirica</i>	Asteraceae	Mugwort	Kunja	Wholeplant*

<i>Caryopteris foetida</i>	Verbenaceae	Caryopteris	Karwi	Leaf*
<i>Chrysanthemum cinerariaefolium</i>	Asteraceae	Pyrethrum	Pyrethrum	Leaves*
<i>Cinnamomum tamala</i>	Lauraceae	Cinnamomum	Tejpat	Leaf, bark*
<i>Hedychium spicatum</i>	Zingiberaceae	Spiked ginger lily	Kapur Kachri	Rhizome*
<i>Pelargonium graveolens</i>	Geraniaceae	Geranium	Ratanjot	Leaves*
<i>Picrorhiza kurroa</i>	Scrophulariaceae	Picrorhiza	Kutki	Rhizome*
<i>Podophyllum hexandrum</i>	Berberidaceae	Himalayan mayappe	Van Kakadi	Rhizome*
<i>Potentilla fulgens</i>	Rosaceae	Silverweed	Bajardanti	Leaves*
<i>Rauwolfia serpentine</i>	Apocynaceae	Indian snake root	Sargandha	Roots*
<i>Rosmarinus officinalis</i>	Lamiaceae	Rosemary	Rosemary	Leaves*
<i>Rubia cordifolia</i>	Rubiaceae	Indian Madder	Majethi	Leaves*
<i>Rumex hastatus</i>	Polygonaceae	Rumex	Almoru	Leaves*
<i>Saussurea costus</i>	Asteraceae	Costus	Kuth	Leaves and roots*
<i>Smilax aspera</i>	Smilacaceae	Italian smilax	Kukurdada	Fruits*
<i>Swertia chirayita</i>	Gentianaceae	Chiretta	Chiraita	Leaf*
<i>Thalictrum foliolosum</i>	Ranunculaceae	Indian meadow	Mamiri	Roots
<i>Urtica dioica</i>	Urticaceae	Annual nettle	Bichu ghas	Leaves and rhizome*
<i>Verbascum thapsus</i>	Scrophulariaceae	Aaron's rod	Akuluveer	Leaf*
<i>Viola tricolor</i>	Violaceae	Viola	Banafsa	Leaf*
<i>Withania somnifera</i>	Solanaceae	Winter cherry	Ashgand)	Leaf*
Oil seed plants				
<i>Brassica campestris</i>	Brassicaceae	Mustard	Sarson	
<i>Brassica nigra</i>	Brassicaceae	Black mustard	Kali Sarson	
<i>Helianthus annuus</i>	Asteraceae	Sun flower	Surajmukhi	
<i>Linum usitatissimum</i>	Linaceae	Flex	Alsi	
Minor cereal crop plants				
<i>Amaranthus caudatus</i>	Amaranthaceae	Amaranthus	Ramdana	
<i>Amaranthus spinosus</i>	Amaranthaceae	Amaranthus	Kantelu Marsu	
<i>Echinochloa frumentacea</i>	Poaceae	Japanese Barnyard Millet	Jhangora	
<i>Eleusine coracana</i>	Poaceae	Finger Millet	Mandua	
<i>Panicum miliaceum</i>	Poaceae	Hog Millet	Cheena	
<i>Setaria italica</i>	Poaceae	Italian Millet	Koni/Kangani	
Pulses				
<i>Glycine max</i>	Fabaceae	Soyabean	Bhat, Soyabean	
<i>Lens culinaris</i>	Fabaceae	Lentil	Masur	
<i>Macrotyloma uniflorum</i>	Fabaceae	Horse gram	Gahat or Kulthi	
<i>Vigna mungo</i>	Fabaceae	Black gram	Urd	
<i>Vigna unguiculata</i>	Fabaceae	Cowpea	Sonta, Lobia	
Forest plants				
<i>Aesculus indica</i>	Hippocastanaceae	Himalayan Chestnut	Pangar	
<i>Alnus nepalensis</i>	Betulaceae	Alder	Utees	
<i>Carpinus viminea</i>	Betulaceae	Hornbeam	Chamkharik	
<i>Cedrus deodara</i>	Pinaceae	Himalayan -Cedar	Deodar	
<i>Lyonia ovalifolia</i>	Ericaceae	Lyonia	Anyar	
<i>Persea odoratissima</i>	Lauraceae	Persea	Kaula	
<i>Pinus roxburghii</i>	Pinaceae	Pine	Chir	
<i>Quercus floribunda</i>	Fagaceae	Green Oak	Moru	
<i>Quercus leucotrichophora</i>	Fagaceae	White Oak	Banj	
<i>Quercus semecarpifolia</i>	Fagaceae	Brown Oak	Kharsu	
<i>Rhododendron arboreum</i>	Ericaceae	Rhododendron	Burans	
<i>Taxus baccata</i>	Cupressaceae	Yew-tree	Thuner	

Note: *) part of plant used.

categorized into different groups as described viz. vegetables, fruits, medicinal plants, pulses etc. However, species used as supplementary foods, vegetables and as an edible fruits are described in this paper (Table 1).

Discussion

The immense richness of botanical resources with

statistics worldwide showed that only a very small fraction of plant resources has yet been utilized by the human race. Even whatever little known, it is mainly about some of the higher plants (Schultes 1963). India is recognized as one of the four major mega biodiversity of Asia. Majority of its forests are in Himalayan region, which although covers only 18% of the geographical area of the country, but

accounts for more than 50% of India's forest cover and 40% of species endemism. The climatic, topographic and soil diversity of this region has resulted into the occurrence of several valuable and economically important plants. In India more than 3000 wild plants are used as subsidiary food and vegetables by various communities (Anon. 1994). It is estimated that in India about 800 species are consumed as food plants, chiefly by the tribal inhabitants (Singh and Arora 1978). Furthermore, 250 species can be developed as a new source of food in the near future (Anon. 1994). Over 170 species provide edible fruits and are consumed by the northeastern tribes. Mostly, it is the fleshy, sweet/sub-sweetish pulp of the fruit that is eaten raw and the tribes have screened the enormously rich flora of the seasonal rain-forest habitats and picked up edible types. Himalaya, one of the richest hot spots of biodiversity in the world, offers immense opportunities in various fields of biological domains and associated patterns of sustainable life support systems. Rich diversity occurs in Himalaya growing naturally under diverse environmental conditions, that is, from dry deciduous forest of north west to rain forest of north east and extending up to the alpine meadows, though the region occupied only 15% of geographical area of the country, but about 30% of the endemic species of Indian subcontinent are found in this region.

The plants genetic resources is of immense importance such as what role do the plants gathered by local inhabitants of the region play in their economic life? If any plant products are bartered or sold; it is to show their quantification and also to indicate possibilities of value addition and entrepreneurship (Jain 2010). The genetic resources surveys reveal that the people of the Bharsar region evolved the mechanism of utility of various resources based on its availability. Some of the major species of plants used by people of the district for their varied requirements have been classified under different categories. The variability in term of utilization of various categories was also observed as a species is used for medicinal purpose by inhabitants of one villages/area, similar species was used as vegetable or for other purposes. *Eleusine coracana*, *Setaria italic*, and *Echinochloa frumentacea* are major food grains after rice and wheat on many occasions including food scarcity. Some traditional uses such as making Chpatis and Laddu out of *Amaranthus* seeds are now at the verge of mislay and therefore, needs to conserve and for this value addition of these in addition to commercialization is required.

Rawat et al. (2010) reported that the people of the Tones valley in Uttarakhand have well knowledge about the properties of various plants spread over 1000-4500 m and are known to derive their food requirements from a numbers of wild plants. *Paeonia emodi*, *Asparagus adscendens*, *Amaranthus viridis*, *Commelina maculata*, *Diplazium esculentum* are the major wild vegetables. In addition, vegetables like *Brassica oleracea*, *Lycopersicon esculentum*, *Solanum tuberosum* are common to diet of these people. All these plants are widely used as vegetables in this area. In addition, *Diplazium polypodioides* (Kuthara) is also reported as vegetables and it was not reported earlier from Uttarakhand. Similarly, some traditional recipes viz.,

Gunala (from leaves of Pinalu and Kadu), Badi, Raitha and Kaphali are although common recipes in the district, however not documented in the earlier literatures.

Rawat et al. (2010) also reported that immature kernel of *Triticum aestivum* are used as Umi and is very delicious recipe which is used as Dal/vegetables is also documented. Badi is generally prepared for the period of scarcity of fresh vegetables especially winter as most of species used as vegetables are available only during May-November. Flowering buds of *Bauhinia variegata* are reported as vegetable in present study. Saikaia et al. (2010) also described that petals of *Bauhinia variegata* are used as vegetable in hill districts of Assam and in Arunachal Pradesh reveals that people residing in hills have evolved more or less similar traditions.

Crops like *Fagopyrum tataricum*, *Amaranthus paniculatus*, *Triticum aestivum*, *Oryza sativa*, *Phaseolus vulgaris*, *Glycine max*, *Macrotyloma uniflorum*, *Vigna mungo* and *Pisum sativum* are common food items in Tones Valley as reported by Rawat et al. (2010). The some species viz., *Glycine max*, *Macrotyloma uniflorum*, and *Vigna mungo* as reported above are also very common crops used as pulses in the region also included in this study as they are widely cultivated. The wild as well as cultivated species of *Dioscorea belophylla* were used during famine in earlier past but now also used during festive occasions.

Medicinal plants like *Artemisia nilagirica*, *Cinnamomum tamala*, *Hedychium spicatum*, *Picrorhiza kurroa*, *Podophyllum hexandrum*, and *Potentilla fulgens* are used by local people in different therapeutics.

Conversely the forest plants are used in this region as timber viz. *Aesculus indica*, *Cedrus deodara*, and *Pinus roxburghii*, and as fuelwood *Alnus nepalensis*, *Cedrus deodara*, *Quercus floribunda*, *Quercus semecarpifolia* and in this region the fodder plants are use such as *Celtis australis*, *Ficus palmata*, and *Grewia optiva*.

Rawat et al. (2010) reported wild fruits such as *Hippophae rhamnoides*, *Fragaria nubicola* species of *Rubus* sp. and *Duchesnea indica* as a common wild fruits to diet of people of Tones valley. *Hippophae rhamnoides* is widely used in Niti Valley as medicinal as the cake is used to cure severe cold and cough and throat infections and used as ingredients of Chutney (local jelly), pickle as reported by Dhyani et al. (2010a,b).

Some species are known as naturally wild edible fruits and vegetables. *Abelmoschus ficulneus*, *Amaranthus dubius*, *Amaranthus viridis*, *Bauhinia variegata*, *Diplazium polypodioides*, and *Dioscorea belophylla* are known as wild vegetables, while *Ficus auriculata*, *Ficus palmata*, *Myrica esculenta*, *Rubus fruticosus*, *Rubus nepalensis*, and *Rubus niveus* are known as wild edible fruits. Fruits of *Myrica esculenta* are now gaining popularity in town because of delicious taste and are being sold by local inhabitants. Similarly fruits of *Rubus* spp. have immense potential for value added entrepreneurship.

CONCLUSION

In general, it reveals that the region is a repository of vast plant genetic knowledge and many plants are used on daily basis to fulfill basic demands. Categories of supplementary food, vegetables, Medicinal and Aromatic plants and wild fruits provide an opportunity for bioprospecting for the discovery of new nutritional elements compounds in future.

REFERENCES

- Anon. 1994. Ethnobotany in India: A Status Report. All India Coordinated Research Project in Ethnobotany. MOEF, GOI, New Delhi.
- Dhyani A, Nautiyal BP, Nautiyal MC 2010a. Importance of Astavarga plants in traditional systems of medicine in Garhwal, Indian Himalaya. *Intl J Biodiv Sci Ecosyst Serv Manag* 6 (1-2): 13-19.
- Dhyani D, Maikhuri RK, Misra S, Rao KS 2010b. Endorsing the declining indigenous ethnobotanical knowledge system of Seabuckthorn in Central Himalaya, India. *J Ethnopharmacol* 127: 329-334.
- Gaur RD. 1999. Flora of district Garhwal North-West Himalaya (with ethnobotanical notes). Pub. Transmedia, Srinagar, Garhwal.
- Jain SK. 2010. Ethnobotany in India: some thoughts on future work. *Ethnobotany* 22: 1-4.
- Kolay AK. 2007. Soil Genesis, Classification Survey and Evaluation, Volume 2. Atlantic Publisher and Distribution Ltd., New Delhi.
- Naithani BD. 1984. Flora of Chamoli. Vol. 1, BSI Pub., Howrah, India.
- Naithani BD. 1985. Flora of Chamoli. Vol. 2, BSI Pub., Howrah, India.
- Negi SS. 1995. Uttarakhand: Land and People. MD Publ., New Delhi.
- Patak MD. 1991. Rice Production in Uttar Pradesh: Progress and Suggestions for Improvement. Wiley Eastern Ltd., New Delhi.
- Rawat VS, Rawat YS, Shah S. 2010. Indigenous knowledge and sustainable development in the Tones Valley of Garhwal Himalaya. *J Med Pl res* 4 (19): 2043-2047
- Saikia B, Doley B, Rethy P, Gajurel PR. 2010. Traditional uses of flowers in Sonitpur district of Assam and Papumpare district of Arunachal Pradesh. *Ethnobotany* 22 (1-2): 121-124.
- Schultes RE. 1963. Botanical sources of the New World narcotics. *Psychodelic Rev* 1: 145-166.
- Singh HB, Arora RK. 1978. Wild Edible Plants of India. ICAR. New Delhi.
- UN News Center, 24/02/2005. World population to reach 9.1 billion in 2050, UN projects. <http://www.un.org/apps/news/story.asp?NewsID=13451>