

Bioprospecting in Garhwal Himalayas, Uttarakhand

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The term bioprospecting has been widely used to assess the economic potential of different plant species and their value-addition. Our folklore with embedded cultural heritage has tremendous possibilities and potential for bioprospecting. Among the over 8000 species of flowering plants growing in the Himalaya, nearly 4000 are identified from the Garhwal Himalayan region. This part of region enjoyed a significant place throughout its history. This region enriched with diverse vegetational wealth and indigenous wisdom of resource use, if subjected to bioprospecting may prove to be a boon for the society.

Keywords: Bioprospecting, conservation, environment, sustainable development, traditional wisdom.

THERE is worldwide realization of social awareness on biodiversity conservation issues. Numerous national and international conferences and meetings have been held on the subject. The Earth Summit, organized through the participation of more than 140 countries in Rio De Janeiro over 15 years ago in June 1992, produced Agenda 21, a blueprint from international cooperation on environment and sustainable development. The conference ultimately resulted in the holding of the Convention on Biological Diversity (CBD), for global commitment towards the conservation of biological diversity and the sustainable and equitable sharing of its benefits arising from the use of genetic resources. Recently, the term bioprospecting has emerged as a new tool for capitalization of traditional wisdom and available natural resources.

The World Resource Institute (WRI) defined bioprospecting as 'Exploration of commercially valuable genetic and biochemical resources'¹. It is felt that the term bio-prospecting should include the cultivation of traditional concepts with contemporary tools, techniques and prospective. It should cover the unconditional welfare of biodiversity itself, with the communities where knowledge is taken through bioprospecting.

The Western concept of adding value through bioprospecting actually hides the removal and destruction of the cultural and social values of indigenous plants and knowledge of the ecosystem as whole. Simpson *et al.*² considered biodiversity in the context of the Western concept of bioprospecting and found that the incentive for biodiversity conservation on the basis of benefits of bioprospecting is not tenable because the value of the benefits is small.

Thus it is important to treat bioprospecting in the context of a strong benefit-sharing system among industries/firms, the ecosystem and the projected communities in such manner as that the sharing of knowledge for bioprospecting will multiply the faunal and floral diversity of that region and enrich the cultural and moral ethics with sustained life-support systems.

The present article attempts to highlight the issue of bioprospecting, especially in the Garhwal Himalayas, Uttarakhand, because traditional knowledge on resource use could not be utilized for the larger benefit of the society for long and so far the knowledge has remained confined to the region. The results reported here are the outcome of an extensive study of the literature on Garhwal flora, its uses and beliefs. Information has also been gathered from local people by an ethnobotanical survey in parts of Uttarkashi, Tehri and Chamoli districts, Uttarakhand. Bioprospecting during the study was confined to non-timber forest products of the region.

Garhwal Himalayas

The Garhwal Himalayas has been a centre of spiritual knowledge, religiosity and pilgrimage from ancient times as mentioned in the *Skanda Purana*. The region is rich in bioresources and fascinating folk culture as well as diverse flora and fauna due to its distinct meteorological, geographic, geological and ecological patterns.

Interestingly, it was an English Army Officer, Major General Thomas Hardwicke, who made the first authentic attempt to collect plants from the region in 1796. He collected plants from Alaknanda valley³. His maiden effort was followed by those of Felix Vincent Rapper and William Spencer Webb, who collected plants from another part of Garhwal region, namely Yamanotri area during

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Table 1. Some important wild plants used in traditional system of medicine in Garhwal Himalayas having potential for bioprospecting

Botanical name	Vernacular name	Part used/mode of application	Uses
<i>Aconitum atrox</i>	Mitha bish,	Paste of rhizome fried in ghee (clarified butter) is applied externally	Rheumatism, neuralgia, paralysis, rheumatic and purpural fever
<i>A. heterophyllum</i>	Atibish	Root powder mixed with honey and galls of <i>Pistacia ichinjuk</i> (kakarsingi) is applied externally	Fever, cough, chills, stomach disorders and diarrhoea
<i>Actaea acuminata</i>	Mamira	Decoction of roots	Bronchial inflammation
<i>Angelica glauca</i>	Choru	Root stocks	Flatulence, colic
<i>Asparagus filicinus</i>	Jhirni	Powder of dried tuberous roots	Sexual debility and urinogenital disorder
<i>Bergenia stracheyi</i>	Shilpari	Root decoction and juice of leaves	Kidney stones, sores, swellings and jaundice
<i>Dactylorrhiza hatagirea</i>	Salampanja	Powder of roots	Cuts and wounds
<i>Dioscorea bulbifera</i>	Genthi	Tubers	Bronchial cough
<i>Dioscorea deltooids</i>	Tairu	Rhizomes	Spermetonorrhoea
<i>Euphorbia hirta</i>	Dudhibari	Entire plant with curd	Piles
<i>Hedychium accuminatum</i>	Kapoorkachri	Purified root powder	Dyspepsia and piles
<i>Megacarpa polyandra</i>	Barmoola	Roots	Fever, stomach disorders
<i>Picrorrhiza kurroo</i>	Kutki	Root powder	Sever coughing, fever and stomach disorder
<i>Rhododendron anthopogon</i>	Bhotiachai	Decoction of leaves	Coryza and catarrh
<i>Thymus linearis</i>	Van ajwain	Extracts of leaves and floral buds	Asthmatic cough
<i>Valeriana jatamansii</i>	Sameva	Roots	Epilepsy, hysteria
<i>Zanthoxylum acanthopodium</i>	Timru	Seed-powder and stem bark	Toothache, tooth decay

Source: Kandari and Gusain⁷.

1802–03. Subsequently, J. F. Royle, the then superintendent of Saharanpur Botanical Garden, collected plants from Dehradun and described them in his illustrations of the botany and other branches of natural history of the Himalayan mountains and the flora of Cashmere during 1833–40 (see Rau⁴ and Babu⁵).

With the establishment of the Botanical Garden at Saharanpur in 1820 and the Forest School in Dehradun during 1878–81, the vegetational exploration in the region received a new impetus⁶. The contributions of Richard Starchey and J. E. Winterbottom in this regard, who instituted the first ever herbarium of plants found in this part of Himalaya, have been noteworthy. They published a catalogue on the plants of the region in the *Atkinson Gazetteer*. It is comprised of about 2000 species and still considered to be one of the best plant collections from this part of the Himalayas.

Bioprospecting

The Garhwal Himalayas along with Kumaun and a part of Himanchal Pradesh has unique characteristics of three provinces – Tibetan in the north, Upper Gangetic Plain in the south and eastern Himalayan provinces in the east. More than 8000 species of flowering plants grow in the Himalayas, with nearly 4000 species identified from the Garhwal Himalayan region along with great diversity⁷. Despite its vegetational wealth, this part of the region enjoyed a significant place throughout its history. Some of the historical, archaeological and anthropological evi-

dences prove the presence of human civilization during Mesolithic age (5000 BC) or Megalithic age (2600 BC). The first known historical race of Garhwal is Kole, which descended from Munda. Subsequently, the Kirata, Khasas, Sakas and many other races like Tangana, Partagana, Naga, Huns and Bhotia had intermixed and settled down in Garhwal Himalaya⁸. These human races prospected the bioresources traditionally.

This region is represented by various tribes and communities with distinct dialects, cultures as well as traditional features, now locally identified as Dasolic, Maj-kummayys, Nagpuria, Salani, Jaunsaris, Bandhani, Raathi, Syura, Tehriyal, in different districts⁹. Each of these groups has its own wisdom about the ethnic use of flowering and non-flowering plants. The indigenous flora utilized by the communities has substantial influences on their culture, customs, craftsmanship, ethos, religious rites, socio-cultural beliefs, food habits, settlement patterns and various other resource-based practices.

There are various plants and plant parts used in religious observances, traditional healthcare practices, in preparation of beverages, fruits and vegetables, as spices and condiments, extraction of oils, gums, resins and natural dyes, production of fuel, fodder and fibre, and preparation of diverse handicraft objects. Some of them are listed in Tables 1–5.

Bioprospecting in the Garhwal Himalaya may not only provide raw materials for pharmaceuticals, but for various other plant-based industries in the field of arts, crafts and homemade edible food items such as jam, jelly, juice, etc.

Table 2. Some important wild edibles of Garhwal Himalayas (vegetables, fruits, seeds/grains, spices and condiment, oils and beverages) having potential for bioprospecting

Botanical name	Vernacular name	Part used	Uses
<i>Angelica glauca</i>	Chora	Underground part	Edible
<i>Asparagus filicinus</i>	Jhinjan	Tuberous roots	Edible
<i>Cyperus rotundus</i>	Motha	Underground part	Edible
<i>Dioscorea bulbiflora</i>	Genthi	Rhizome	Edible
<i>Orchis latifolia</i>	Hatajari	Roots	Edible
<i>Vigna vexillata</i>	Pholi	Underground part	Edible
<i>Adhatoda zeylanica</i>	Basing	Young shoots/leaves	Edible
<i>Amaranthus caudatus</i>	Marchhu	Young shoots/leaves	Edible
<i>Bergenia ciliata</i>	Patharchhata	Young shoots/leaves	Edible
<i>Oxalis corniculata</i>	Chalmosi	Young shoots/leaves	Edible
<i>Rheum australe</i>	Archa	Young shoots/leaves	Edible
<i>Rumex hastatus</i>	Kilmoru	Young shoots/leaves	Edible
<i>Smilax glaucophylla</i>	Kanjolya	Young shoots/leaves	Edible
<i>Urtica dioeca</i> and <i>U. parviflora</i>	Kandali	Young shoots/leaves	Edible
<i>Bauhinia purpurea</i>	Guiral	Flowers	Edible
<i>Bombax ceiba</i>	Semwal	Flowers	Edible
<i>Woodfordia fruticosa</i>	Dhaura	Flowers	Edible
<i>Ficus auriculata</i>	Timla	Unripe fruit	Edible
<i>Aegle marmelos</i>	Bel	Fruit	Edible when ripe
<i>Aesculus indica</i>	Pangar	Fruit	Eaten roasted
<i>Cornus capitata</i>	Bhamor	Fruit	Eaten when ripe
<i>Elaeagnus angustifolia</i>	Giwain	Fruit	Eaten raw/ripe
<i>Fragaria vesca</i>	Bhuin kaphal	Fruit	Eaten raw/ripe
<i>Grewia optiva</i>	Vimal	Fruit	Eaten raw/ripe
<i>Myrica esculanta</i>	Kaphal	Fruit	Eaten raw/ripe
<i>Prunus</i> sp.	Chula/payan/jamni	Fruit	Eaten raw and ripe
<i>Rhus parviflora</i>	Titnulya	Fruit	Eaten raw
<i>Cannabis sativa</i>	Bhang	Seeds/grains	Eaten raw and roasted
<i>Cleome viscosa</i>	Jakhya	Seeds/grains	Used as spices
<i>Impatiens balsamina</i>	Manjrulya	Seeds/grains	Eaten raw
<i>Juglans regia</i>	Akhore	Fruit	Dry fruits
<i>Allium griffithianum</i>	Jambo	Seeds/grains	Spices and condiments
<i>A. humile</i>	Laadu	Seeds/grains	Spices and condiments
<i>Alpinia galanga</i>	Kalji	Rhizome	Spices and condiments
<i>Angelica glauca</i>	Choru	Seeds/grains/roots	Spices and condiments
<i>Mentha arvensis</i>	Pothya	Leaves	Spices and condiments
<i>Zanthoxylum acanthopodium</i>	Timru	Fruits/seeds	Spices and condiments
<i>Brasica napus</i>	Lahiya	Seeds	Oil
<i>B. juncea</i>	Rai		
<i>Prunus armeniaca</i>	Chula	Seeds	Oil
<i>Buxus wallichiana</i>	Papri	Leaves/barks	Non-alcoholic beverage
<i>Cassia occidentalis</i>	Chakunda	Seeds	Non-alcoholic beverage
<i>Hippophae rhamnoides</i>	Amlich	Fruits	Non-alcoholic beverage
<i>Punica granatum</i>	Darim	Fruits	Non-alcoholic beverage and chatni
<i>Rhododendron anthopogon</i>	Botyachaa	Leaves	Non-alcoholic beverage
<i>Rhododendron arboreum</i>	Burans	Flowers (petals)	Non-alcoholic beverage
<i>Taxus baccata</i>	Thuner	Bark and leaves	Non-alcoholic beverage
<i>Viola</i> sp.	Somaya	Leaves	Non-alcoholic beverage
<i>Andrachne cordifolia</i>	Bhotti	–	Alcoholic beverage
<i>Bupleurum falcatum</i>	Tirmiri	–	Alcoholic beverage
<i>Datura stramonium</i>	Dhatura	–	Alcoholic beverage
<i>Hemidesmus indicus</i>	Morchiyapar	–	Alcoholic beverage
<i>Rubus ellipticus</i>	Hinsar	–	Alcoholic beverage
<i>R. niveus</i>	Kali hinsar	–	Alcoholic beverage
<i>Taraxacum officinale</i>	Karhatu	–	Alcoholic beverage

Source: Kandari and Gusain⁷.

Although wild edible plants are not consumed in large quantities, their nutritional value and role in local communities cannot be ignored. Maikhuri *et al.*¹⁰ have estimated about

13 potential wild species including *Rhododendron arboretum* (Burans), *Myrica nagi*, *Hippophae rhamnoides* and *Rubus ellipticus* with several cultivated species of *Citrus*,

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Table 3. Some important fibre-yielding plants from Garhwal Himalayas

Botanical name	Vernacular name	Part used	Uses
<i>Agave cantala</i>	Cantala	Stem	Fibre for rope, basket, mat, etc.
<i>Boehmeria platyphlla</i>	–	Stem	-do-
<i>Cannabis sativa</i>	Bhangla	Stem	-do-
<i>Cissampelos pareira</i>	Pani bel	Stem	-do-
<i>Girardiana palmate</i>	–	Stem	-do-
<i>Grewia optiva</i>	Vimal	Stem	-do-
<i>Hibiscus canabinus</i>	Bimli/ambari	Stem	-do-
<i>Urtica parviflora</i>	Kandali	Stem	-do-
<i>Bauhinia vahlii</i>	Mallu	Bark	-do-
<i>Ichnocarpus frutescence</i>	Kalidudhi/bel kamu	Bark	-do-
<i>Marsdenia roylei</i>	Shengori	Stem/bark	Fibre for fishing, etc.
<i>Cryptolepis buchananii</i>	Singhi/medha singhi	Stem/bark	-do-
<i>Porana ciliate</i>	Safed bel	Stem/bark	-do-

Source: Kandari and Gusain⁷.

Table 4. Plants from Garhwal Himalayas with prospects for use in handicrafts

Botanical name	Vernacular name	Part used for
<i>Aesculus indicus</i>	Pangar	Cooperage, toys, etc.
<i>Buxus semipervirons</i>	Papri	Wood is used for making cricket bats, hockey sticks and other sports items
<i>Cannabis sativa</i>	Bhangla	Ropes and cordage
<i>Cedrus deodara</i>	Deodar	Boxes, bed, etc.
<i>Chimonobambusa falcate</i> or <i>Arundinaria falcata</i>	Go-ringal	Baskets and other handicraft items
<i>Dendrocalamus strictus</i>	Tham	-do-
<i>Grewia optiva</i>	Vimal	Ropes and cordage, etc.
<i>Ichnocarpus frutescens</i>	Belkarm	Baskets, etc.
<i>Rhododendron arboreum</i>	Burans	Cooperage and other domestic items
<i>Taxus baccata</i>	Thuner	Boxes and other domestic items
<i>Thamnocalamus spathiflora</i> or <i>Arundinaria spathiflora</i>	Deo-ringal	Baskets and other handicraft items

Table 5. Plants used as dyes, insecticides, piscicides and in the making of brooms

Botanical name	Vernacular name	Part used	Uses
<i>Berberis aristata</i>	Kingore	Wood and roots	Dyes (yellow)
<i>B. chitria</i>	Chotar	Wood and roots	Dyes (yellow)
<i>Cornus capitata</i>	Bhamore	Stem	Red
<i>Juglans regia</i>	Akhore	Leaves and fruits	Yellow dye
<i>Mallotus philippenensis</i>	Ruina	Ripe fruits	Orange dye
<i>Myrica esculenta</i>	Kaphal	Stem	Brown dye
<i>Prinsepia utilis</i>	Bhekhal	Fruits	Blue dye
<i>Arisaema tortuosum</i>	Meen	Tubers	Insecticides/piscicides
<i>Butea fructicosa</i>	Dhak	Seeds	Insecticides
<i>Hedera nepalensis</i>	Laglya	Leaves	Repellents
<i>Cedrus deodara</i>	Deodar	Seeds	Repellents
<i>Murraya koenigii</i>	Gandhela	Leaves	Repellents
<i>Zanthoxylum acanthopodium</i>	Timru	Fruits	Insecticides/piscicides
<i>Diploknema butyracea</i>	Cheura	Seeds	Piscicides
<i>Houttyunia cordata</i>	Machhalia	Entire plant	Piscicides

Source: Kandari and Gusain⁷.

etc. having great prospects for utilization from the Garhwal Himalayas.

Conclusion

Traditional knowledge is an integral part of our country. India's magnificent past and its immense vegetational

wealth places the country among the mega-biodiversity centres of the world. Unlike other developed Asian countries such as Japan, Korea and China, we have not been able to capitalize much on our natural resources and inherited wisdom. For developing countries like India, there is an urgent need to identify at least the existing bio-resources and traditional wisdom to prevent biopiracy and

building up capabilities to utilize natural resources and capitalize on the grassroots knowledge for potential rural economy.

It would be an emerging sector for future research and development programmes, enabling us to make use of biodiversity for noble causes and conservation.

The Garhwal Himalayas which is enriched with diverse vegetational wealth and indigenous wisdom of resource use, if subjected to bioprospecting may prove to be a boon for the society.

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Received 23 August 2007; revised accepted 24 March 2008
