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SACRED LANDSCAPES AS REPOSITORIES OF BIODIVERSITY. A CASE STUDY FROM THE HARIYALI DEVI SACRED LANDSCAPE, UTTARAKHAND

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Abstract

The present study was carried out in the Hariyali Devi sacred landscape of Garhwal Himalaya in Uttarakhand State of India. The study area falls under the jurisdiction of the Forest Department, having the status of reserve forest. The land scape is dedicated to the deity "Hariyali Devi" and that plays a major role in conserving the biodiversity of this land scape. Taboos, rituals and socio-cultural practices are associated with conservation practices. The study recorded 98 plant species, representing 88 genera and 46 families with different economic values. The dominant family was Rosaceae, which recorded the highest (10) number of species. Out of 98 plant species the dominant life form contribution was of herbs (52), shrubs (26) and tree species (21). Almost 82 plants species in the landscape are of medicinal importance, 15 species are used for timber and construction purposes, 19 species with different edible plant parts, such as fruits, flowers, seeds and rhizomes. The information about the uses/economic value of different plant species was gathered directly by interviewing knowledgeable elderly local villagers (including women).

Keywords: *Sacred landscape; Himalaya; Conservation; Biodiversity.*

Introduction

In view of the adverse effects of biodiversity degradation, ecologists, environmentalists and conservationists made of the conservation of biodiversity an issue of global, national and regional significance. Many policies governing the conservation of biodiversity have also been issued from time to time including the Convention of Biological Diversity (CBD) by the Govt. of India. Apart from these formal laws, there are many traditional conservation practices of indigenous communities in many parts of the world, which contribute to the conservation and protection of biodiversity. A good example of such traditional practices is the conservation and protection of small forest patches by various indigenous communities of the world, by dedicating them to local deities. Such patches are called Sacred Groves [1]. All forms of vegetation in the sacred groves are supposed to be under the protection of the reigning deity of that grove, and the removal of even a small twig is a taboo [2].

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Gene pools have co-existed with humankind for centuries in different dimensions and entities. *In situ* conservation of biodiversity is possible in many ways and it has withstood the test of time. “Sacred groves” can be placed in this category. The “sacred groves” are in fact the “reserve forests” of the local tribes/communities who maintain/conserve these patches of woodlands in a religious manner. They act as natural gene pool reservations and serve as an example of habitat preservation through community participation [3]. The existence of sacred groves is reported in many parts of Asia, Africa, Europe, Australia and America [4]. In India sacred groves are mainly found in areas dominated by tribes and are known by different names in the local tongues [5]. Several studies were conducted on sacred groves in different parts of India. There is an estimate of 4215 sacred groves covering an area of 39,063 hectares distributed in India [6].

Uttarakhand state also called Dev Bhumi, or the abode of gods, is unique in this regard. The landscape is dotted with many holy places of worship. These places are often of small to medium size with natural vegetation as a sacred grove of the deity. There are several studies on sacred groves in India. However, there are few studies on this aspect in Uttarakhand. There are some well known sacred groves which truly represent the wealth of a religion based conservation traditions. [7]. Even though the biological diversity of Himalaya is very rich, there is little information available on the sacred groves and the conservation of biodiversity in Garhwal Himalaya [8].

Study area

Hariyali Landscape (30-13 to 39-19N and 79-79-7E) lying between 1500 and 2800m in Garhwal region of the Central Himalaya is situated above Kodima village, at a distance of 32 km from the nearest town, Gaucher (on the route to Badrinath shrine NH no.58) in the Chamoli district of Uttarakhand. The study area of 5.5 km^2 falls under the jurisdiction of the Forest Department, having the status of reserve forest. Climatically there are three distinct seasons: (i) the summer (March-June) with maximum and minimum temperature of 32.3°C and 18.3°C, respectively, (ii) the rainy season (July to October) with maximum and minimum air temperature of 29.3°C and 20.8°C, respectively and (iii) the winter season (November to February) with maximum and minimum air temperature of 24.9°C and 13.2°C, respectively [9].

Methodology

A field survey was carried out during 2009 to identify different plant species present in the Hariyali landscape. The identification of plant species was done with the help of local villagers and the plant samples were collected and further identified with relevant flora records and literature. The information about the uses/economic value of different plant species was gathered directly by interviewing knowledgeable elderly local villagers (including women) residing within the area, who are using these plant species traditionally, as passed on to them from their ancestors. Secondary literature, such as different flora records and various publications were also taken into account in order to learn about the different values/uses of these plant species present in the landscape.

Results and discussion

The role of the Goddess "Hariyali Devi" in conserving the biodiversity is obvious from the rich and dense biodiversity of the Hariyali landscape. The predominant vegetation is *Quercus semecarpifolia*, *Quercus leucotrichophora*, *Rhododendron arboretum*, and *Lyonia ovalifolia*. Rituals, taboos and folklores are associated traditionally through socio-cultural belief, creating an environment of using resources in a sustainable manner. The survey recorded 98 plant species with different economic values, such as medicine, timber, fuel wood etc (Table.1).

Table 1. Uses/economic value of different plant species in the study area.

Scientific name	Common name	Family	Use/ value
Trees			
Abies spectabilis (D.Don)Mirbel	Morinda, raga	Pinaceae	Medicine, wood
Aesculus indica (Colebr.ex Cambess)	Pangar	Hippocastanaceae	Wood, fruit, medicine, Fodder
Alnus nepalensis (D.Don)	Utees	Betulaceae	Wood,medicine, soil binder
Benthamedia capitata (Wallich ex Roxb.)	Bhamora	Cornaceae	Edible fruit, wood,
Betula alnoides Buch.Ham.ex D.Don	Bhuja patra	Betulaceae	Wood, fodder,medicine
Cupressus torulosa D.Don	Surai	Cupressaceae	Wood, medicine
Ilex dipyrena Wallich in Roxb.	Kandara	Aquifoliaceae	Agriculture implements, fuel
Juglans regia L.,	Akhroat	Juglandaceae	edible fruit, medicine, dye
Lindera pulcherrima Benth.ex. Hook.f	Cheri	Lauraceae	Wood, manure
Lyonia ovalifolia (Wallich)	Anyar	Ericaceae	Medicine, Fuel
Myrica esculenta. Buch-Ham.ex D.Don	Kaphal	Myricaceae	Edible fruit, medicine
Persea gamblei (King ex Hook.f.)	Kauwla	Lauraceae	Agricultural implments
Picea smithiana (Wallich)	Rai, spruce	Pinaceae	Medicine, wood
Pinus wallichiana A.B Jackson	Kail	Pinaceae	Wood, medicine, and paint
Prunus cornuta (Wallich ex Royle)	Jamna	Rosaceae	Wood, fodder,medicine
Pyrus pashia Buch-Ham.ex D.Don	Mehal	Rosaceae	Wood, fodder,medicine, edible
Quercus floribunda Lindley ex Rehder	Tilonj	Fagaceae	Construction, fodder, fuel,edible
Quercus leucotrichophora A.	Banj	Fagaceae	Construction, fodder, medicine
Quercus semecarpifolia J.E.Smith in Rees	Kharsu	Fagaceae	Fodder, social forestry
Rhododendron arboreum Smith	Burans	Ericaceae	Wood, edible flowers, medicinal
Shrubs			
Abelia triflora R.Br. Ex Wallich	Gogti	Caprifolaceae	Walking sticks, fodder
Berberis asiatica Roxb. ex	Kilmora, kingor	Berberidaceae	Wood, medicinal
Boenninghausenia albiflora (Hook.)	Pishumar	Boenninghausenia	Medicinal
Daphne papyraceae Wallich ex Steudel,	Satpura	Thymelaeaceae	Religious, medicinal, ropes
Debregeaia longifolia (Burm. F.)	Tusara	Urticaceae	Fodder, medicine, Ropes
Desmodium elegans DC.,	Chamlai	Fagaceae	Medicine
Deutzia compacta Craib	Mhujvar	Hydrangeaceae	Medicine
Eleagnus parviflora Wallich ex Royle	Giwain, kanal	Elaeagnaceae	Medicine, fruits edible, Fodder
Elsholtzia flava (Benth.)		Lamiaceae	Medicinal, aromatic
Elsholtzia fructicosa (D.Don)	Pothi	Lamiaceae	Medicinal, aromatic
Hedera nepalensis K. koch	Laguli	Araliaceae	Medicinal
Indigofera heterantha Wallich ex Brandis	Sakina, kathi	Fabaceae	Medicinal, fodder, Edible
Leptodermis lanceolata Wallich in Roxb.	Padera	Rubiaceae	Medicinal, fodder
Lonicera quinquelocularis Hardwicke	Taknoi	Caprifolaceae	Edible, walking sticks
Myrsine africana L.	Chupra	Myricaceae	Medicinal
Prinsepia utilis Royle,		Rosaceae	Seed edible, medicinal
Randia tetrasperma (Roxb.)	Kamoli	Rubiaceae	Fuel, walking sticks, medicinal
Rhamnus virgatus Roxb.	Chentuli	Rhamnaceae	Fuel, medicinal
Rosa brunonii Lindley	Kunja	Rosaceae	Medicinal, soil binder
Rosa sericea Lindely	Dhurkunja	Rosaceae	Fruits edible, medicinal, tea
Rubus foliolosus D.Don	Kala hisar	Rosaceae	Fruits edible
Sarcococca saligna (D.Don)	Piruli, geru	Buxaceae	Sticks, soil binder, medicinal

Skimmia anquetilia Taylor	Nairpatti	Rutaceae	Agricultural use, sticks, medicinal
Spiraea bella Sims	Kuji	Rosaceae	Medicinal, brooms
Viburnum cordifolium (D.Don)	Bhatnoi, guya	Caprifolaceae	Fruits edible, medicinal
Zanthoxylum aspera		Rutaceae	Medicinal
Herbs			
Achyranthes aspera L.	Latjiri	Amaranthaceae	Medicinal
Ageratum conyzoides L.	Gundrya	Asteraceae	Medicinal
Agrimonia pilosa Ledebour var. nepalensis	Lesukuria	Rosaceae	Medicinal
Ainsliaea apetra DC.	Khad-jari	Asteraceae	Medicinal
Ajuga parviflora Benth.	Bugle	Lamiaceae	Medicinal
Anaphalis triplinervis (Sims)	Bugla	Asteraceae	Medicinal
Anemone obtusiloba D.Don	Kanchphool	Ranunculaceae	Medicinal
Arisaema intermedium Blume	Meen	Araceae	Medicinal
Arisaema jacquemontii	Khaprya	Araceae	Medicinal
Barleria cristata L.	Kala-bansa	Acanthaceae	Medicinal, soil binder
Bryophyllum pinnatum (Lam.)	Bish-khapura	Crassulaceae	Medicinal
Cirssium wallichi		Asteraceae	Medicinal
Cyathula tomentosa (Roth)	Lichkura	Amaranthaceae	Medicinal and fodder
Cynoglossum glochidiatum (Wallich ex Hornem)	Lichkura	Boraginaceae	Medicinal
Dipsacus innermis Wallich.	Phulee	Dipsaceae	Vegetable, medicinal
Fragaria nubicola Lindley ex Lacaita	Gand-kaphal	Rosaceae	Fruits edible, medicinal
Galium aparine L.	khuskusa	Rubiaceae	Medicinal
Gentiana capitata Buch-Ham.ex D.Don		Gentianaceae	Medicinal
Geranium nepalense Sweet	Phori	Geraniaceae	Medicinal, Tennin
Girardiana diversifolia (Link) Friis	Bhainsya	Utricaceae	Fibre, ropes and medicinal
Hedychium spicatum Buch-Ham.ex J.E	Ban haldi	Zingiberaceae	Medicinal
Hemiphragma heterophyllum Wallich		Scrophulariaceae	Medicinal , edible
Heracleum lanatum Michaux	Kakriya	Apiaceae	Edible, medicinal
Hypericum elodeoides Choisy	Basanti	Hypericaceae	Medicinal
Impatiens sulcata Wallich	Chaul	Araliaceae	Edible, medicinal
Justicia procumbens L.		Acanthaceae	Medicinal
Lathyrus aphaca L	Kurphali	Fabaceae	Fodder
Lespedeza juncea (L. f.) Persoon		Fabaceae	Soil binder
Micromeria biflora (Buch-Ham.ex D.Don) Benth	Gorakhopan	Lamiaceae	Medicinal
Origanum vulgare L.	Ban tulsi	Lamiaceae	Vegetable, medicinal
Oxalis corniculata L.	Bhilmori	Oxalidaceae	Vegetable, medicinal
Oxalis latifolia		Oxalidaceae	Medicinal
Pepromia tetraphylla (Forster f.) Hook.& Arn	Tirpirya	Aristolochiaceae	Medicinal
Peristrophe paniculata (Forsk.) Brumitt	Kaknadi	Acanthaceae	Medicinal
Pimpinella diversifolia (DC.)	teroi	Apiaceae	Medicinal
Potentilla fulgens Wallich ex Hook. In Bot. Mag	Bajardantu	Rosaceae	Edible, medicinal
Prunella vulgaris L.	Self heal	Lamiaceae	Medicinal
Ranunculus laetus Wallich ex D.Don		Ranunculaceae	Medicinal
Roscoea purpurea J.E. Smith Var. Purpurea		Zingiberaceae	Medicinal
Rumex hastatus D.Don	Almoru	Polygonaceae	Medicinal
Rumex nepalensis Sprengel	Khatura	Polygonaceae	Vegetable, medicinal
Salvia lanata Roxb.	Ghanyajhar	Lamiaceae	Medicinal and bee-forage source
Selinum vaginatum (Edgew.) C.B.Clark	Butkeshi	Spigeliaceae	Medicinal
Silene edgeworthii Bocquet in Candollea	Bakroyla	Caryophyllaceae	Medicinal
Solanum erietinum D.Don	Ban-tambakhu	Solanaceae	Edible fruits, medicinal
Solanum nigrum L.	Banbhatuja	Solanaceae	Medicinal
Stellaria media (L.) Villars	Badyalu	Caryophyllaceae	Vegetable, medicinal, Fodder
Strobilanthes purpureus		Acanthaceae	Medicinal
Swertia angustifolia Buch-Ham. Ex D.Don	Chirata	Gentianaceae	Medicinal
Thalictrum javanicum Blume	Mamiri	Ranunculaceae	Medicinal

There are 88 genera and 46 families. The dominant family was Rosaceae, with the highest (10) number of species, followed by Lamiaceae (7) and Fagaceae, Astraceae, Acanthaceae (4) (Fig.1).

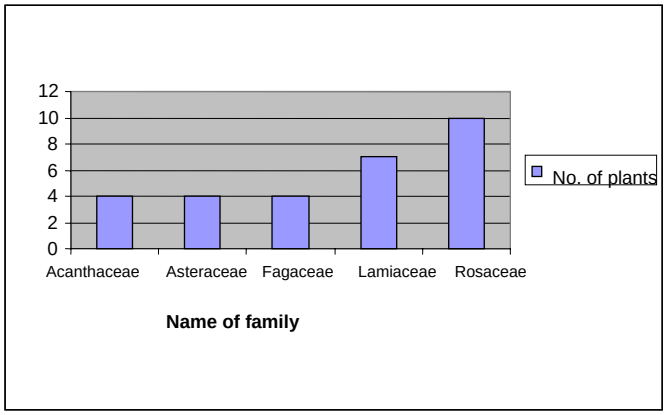

Fig. 1. The dominant top five families

Out of 98 plant species the dominant life form contribution was that of herbs (52), shrubs (26) and tree species (21) (Fig.2). The villagers protect the landscape due to a myth, which came to support the conservation. According to Bhagwat Puran, Yogmaya was the sister of lord Krishna, and she replaced him in the cell of his parents when Kansa threw her against the wall. She turned into lighting and came to "Hari Parvat" (Hariyali is a Sanskrit word, which means "Green all around" and Parvat means "mountain") to make her abode. Since then she came to be known as Hariyali Devi and the adjoining forest is called "Hariyali". [10]

The landscape harbors a large number of herbs, shrubs and tree species which are economically important and are used in different sectors by different sections of society.

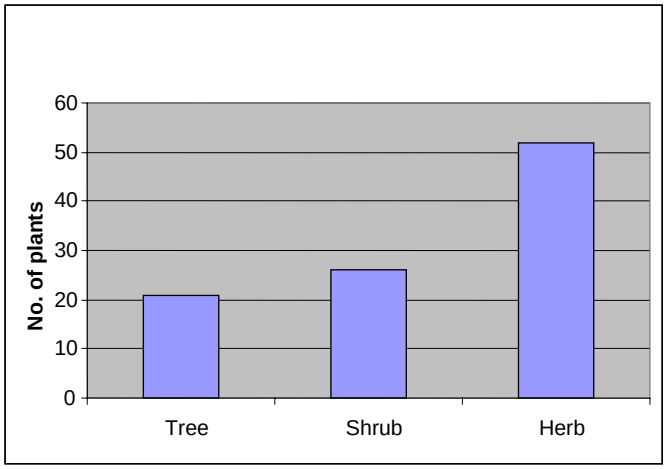

Fig. 2. Life forms of different plant species

Almost 82 plants species in the landscape are of medicinal importance, 15 species are used for timber and construction purposes, 19 species have different edible plant parts, such as fruits, flowers, seeds and rhizomes etc (Fig 3).

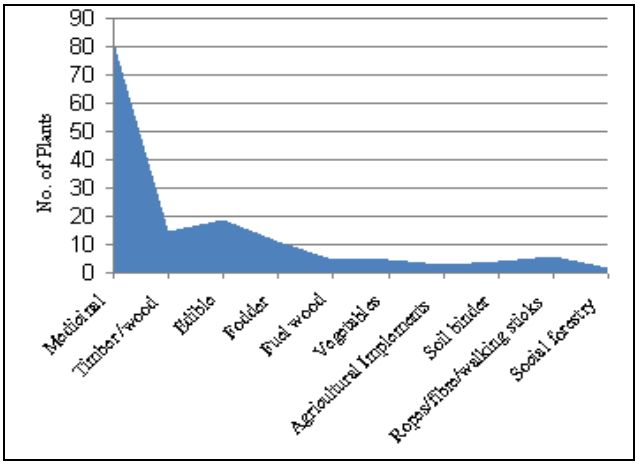

Fig. 3. Number of plants species having different uses/economic value.

The inhabitants of Uttarakhand state are still dependent on traditional vaidyas (practitioners of Ayurveda) for treating diseases, due to isolation and the relatively poor access to modern medical facilities [11]. Different parts of plants, such as leaves, stems and fruits are used for different medicinal purposes. A large number of diseases are cured by making a mixture of different plant parts. However people do not depend on the medicinal plants too much, as they do not have too much knowledge. Other resources, as the collection of fodder, fuel wood, vegetables and material for agricultural purposes are a daily routine for the villagers. Some tree species, important in Argo forestry and social forestry programs, are also present in the landscape.

Conclusions

The present study revealed that the Hariyali landscape can be considered a model of in situ conservation of biodiversity and can be a possible candidate for the selection of a biodiversity heritage site in Uttarakhand. Biodiversity sustains all life processes and contributes directly to human wellbeing, by supporting the production of food, fuel, fiber and genetic material. In general, however, it is widely believed that the loss of biodiversity and ecosystem degradation jeopardize human wellbeing, both now and in the future [12]. The villagers protect the landscape out of fear of a deity and due to the presence of traditionally used plant materials from the forest, which are also economically important and a good reason for the conservation of biodiversity for the future. Illegal cutting of plants, the prohibition of weapons and of hunting out of fear of a deity in this forest, also nurtures animals, such as deers, the Himalayan bear, leopard and porcupines etc. However, the key for further success towards a future conservation of religiously preserved patches, under the present threats and circumstances, lies in the education of locals, of planners and political managers, on the significance of such sacred areas.

Such religiously protected areas provide a comprehensive and rich ecological niche, as repositories of genetic diversity [13]. Villagers inhabiting the area depend on the forest for fuel wood and fodder collection and some part of that is provided by this landscape. The low cost of herbal medicine, wild edible plants, vegetables, spices and condiments are traditionally collected and used from this landscape. Moreover, the cost of modern medicine is twenty times higher than the cost of indigenous medicine, so there is a public demand for services [14]. Creating awareness among the inhabitants in regard to the presence of large genetic diversity, sustainable use of resources, can lead to a secure future of this landscape. The present study revealed that the Hariyali landscape can be considered a model of in situ conservation of biodiversity, which is useful for human welfare as well as for the conservation of genetic diversity.

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