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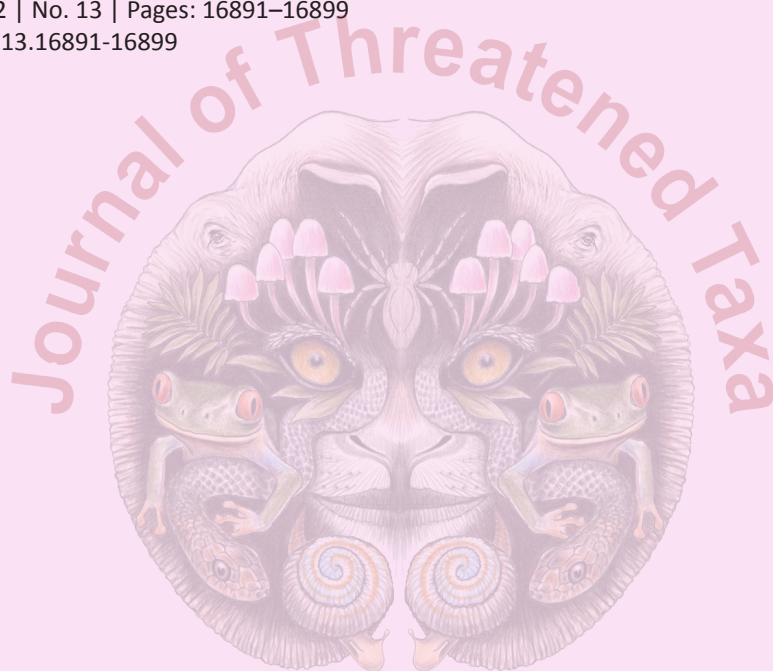
## SHORT COMMUNICATION

### INDIGENOUS USES AND TRADITIONAL PRACTICES OF ENDEMIC AND THREATENED CHILGOZA PINE *PINUS GERARDIANA* WALL. EX D.DON BY TRIBAL COMMUNITIES IN KINNAUR DISTRICT, HIMACHAL PRADESH, NORTHWESTERN HIMALAYA

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## Indigenous uses and traditional practices of endemic and threatened Chilgoza Pine *Pinus gerardiana* Wall. ex D.Don by tribal communities in Kinnaur District, Himachal Pradesh, northwestern Himalaya

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**Abstract:** *Pinus gerardiana* is an endemic and threatened pine of northwestern Himalaya. It is the only conifer in India which is traded for its nuts. In addition to subsidiary source of income to Kinnaura tribes, it is an important part of ecology, traditions, and culture of Kinnaur District of Himachal Pradesh. Kinnaura are one of the largest ethnic groups of Himachal Pradesh famous for their own unique traditions, culture, and lifestyle. In view of this, the present study was conducted to document the indigenous uses and traditional practices of *Pinus gerardiana* (Chilgoza Pine) by Kinnaura tribes of Himachal Pradesh. At present, destructive harvesting practices of collection of Chilgoza nuts, fuelwood, torchwood, timber, and needles of Chilgoza Pine is not only causing serious damage to trees but also affecting its natural regeneration and future crop production. Thus, this continuous loss of Chilgoza Pine will affect the livelihood of the tribal communities and ecosystem of the area in near future. Hence, population assessment, ecological niche modeling, awareness programmes, and sustainable harvesting of cones are suggested for its conservation.

**Keywords:** Endemic, indigenous uses, threatened, tribal communities.

The Himalayan region is one of the recognized mega biodiversity hotspots (Johnsingh et al. 1998; Mittermeier et al. 2004) as it is known for rich, representative, natural, unique and socio-economically

important species (Samant et al. 1998, 2007). Among the conifers of Himalayan region, *Pinus gerardiana* is very popular. This species is native and endemic to the northwestern Himalaya (Kumar et al. 2013) and falls under the threatened category. It belongs to the family Pinaceae and is a well-established multipurpose species in the area of occurrence. This species was discovered by British Army Officer Captain Patrick Gerard in 1932 (Farjon 1984) and commonly known as Chilgoza or Neoza and also known as 'Ree' in Kinnaur. Chilgoza Pine is a very slow growing tree and its average life span is 150–200 years. It is a small to medium size tree up to 25m tall. Chilgoza Pine is the only conifer in India, which is traded for its edible nuts which are rich source of carbohydrate (21.6%), proteins (15.9%), fats (49.9%), moisture content (7.5%), fiber (2.2%), and mineral matter (2.90%) (Anonymous 1969). The species has restricted distribution in India and is confined to hilly tracts in dry temperate region of northwestern Himalaya at 1,600–3,300 m and also extends in the mountains of

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eastern Afghanistan and Pakistan. In Himachal Pradesh, it mainly occurs in Kinnaur District and Pangi divisions and Threta range of Chamba Forest Division. In Kinnaur District Chilgoza is found only in Morang, Kalpa, Kilba, and Pooh forest ranges of Kinnaur forest division. It also extends westwards to Kishtwar District of Jammu & Kashmir union territory. Chilgoza Pine is found associated with *Cedrus deodara*, *Pinus wallichiana*, *Juniperus polycarpus*, *Fraxinus xanthoxyloides* at higher elevations and with *Quercus ilex*, *Olea cuspidata*, and *Alnus nitida* at lower elevations. The undergrowth in Chilgoza forest are represented by *Daphne oleoides*, *Lonicera quinquelocularis*, *Lonicera hypoleuca*, *Ephedra gerardiana*, *Rosa webbiana*, and *Artemisia maritima*. In Kinnaur District, the species replaces *Pinus roxburghii* (Cheel) near Wangtu and continues along the Sutlej Valley up to Dubling, Ropa, and up to Lambar in Tidong Valley.

Seeds of Chilgoza are the only commercial edible pine nuts available in India and accordingly major source of its indigenous supply is Kinnaur District of Himachal Pradesh. Small quantities of the nut, however, are also collected from Pangi Valley (Chamba District) of Himachal Pradesh besides some parts of Jammu & Kashmir union territory. Out of total 2,060ha in Himachal Pradesh, about 2,040ha falls in Kinnaur Division and a small portion (20ha) in Chamba District (Troup 1921), which is the main source of Chilgoza nuts in the country. Being in short supply there is a heavy demand of Neoza nuts (sold as dry fruit) and 80–100 tons per year Chilgoza reaching the Indian market comes from Kinnaur District. The approximate export value of its annual produce is around INR 180 million (Negi 2002). On an average, one tree yields about 7.4kg of nuts per year. Income from the sale of Chilgoza seeds contributes to the annual income of many poor tribal families of Kinnaur, usually in the form of supplementary income. For some families, however, this species is the main source of income. Overall, in the zone, the share of the financial income due to Chilgoza in the total financial income of the households varies 5–25 %; this share can exceed 25% for some household (Peltier & Dauffy 2009). Chilgoza Pine are mostly located in natural forests, and are not cultivated by local people because of its slow growth and takes long time to produce commercial nuts. But, due to the dependency of local people, it has been classified as social forestry species in spite of being a conifer (Sehgal & Khosla 1986). In Afghanistan, the government promotes community-based conservation programmes to protect and conserve the Chilgoza Pine and also to enhance the livelihood of local communities (MAIL 2012). The

area under Chilgoza forest has already shrunk to about 2,000ha in Himachal Pradesh because each and every cone is lopped except those which are out of reach and left on the trees by the tribal communities (Tandon 1963; Singh et al. 1973; Sehgal & Sharma 1989), which not only affect natural regeneration, but also future crop production.

Previously, Chilgoza of Kinnaur was not so intensively exploited for nuts, because Chilgoza forest of Afghanistan and Baluchistan used to meet most of the country's requirement before partition (Tandon 1963). In addition to this, in the past, due to the concern for wild animals and natural regeneration, the tribal communities kept some cones on trees to allow a small portion of seeds to reach the ground and regenerate. In spite of difficult ecological conditions, the forests of the species are able to regenerate. During the last five decades, the network of roads has allowed horticulture development in Kinnaur due to which tribal communities have started considering Chilgoza as subsidiary source of income. The village communities sell the nuts harvest contracts to private contractors who employ contractual workers for harvesting Chilgoza cones. They cut many branches and collect all cones without the concern of future cone production and natural regeneration. Since, there is no restriction on the quantity of Chilgoza nuts collection and the tribal communities harvest almost every mature cone resulting in poor regeneration. Due to lack of regeneration, young size classes of trees are scarce or entirely lacking, while mature and over mature trees predominating in its natural habitat. Today, due to over exploitation and habitat destruction, reduction in Chilgoza Pine forests is growing concern throughout the range of distribution. Because of its dwindling population, this species is also listed in the Near Threatened category as per IUCN threat category (Farjon 2013). The studies carried out so far are related to ecology, regeneration and insect pest problems of Chilgoza Pine, however, none of the studies have investigated and documented the traditional uses of Chilgoza Pine. Therefore, the present study was carried out to document the indigenous knowledge and traditional practices of Chilgoza Pine in Kinnaur District of Himachal Pradesh.

## MATERIAL AND METHODS

### Study Area

Kinnaur is one of the tribal districts of Himachal Pradesh (31°55'50"–32°05'15" N & 77°45'00"–79°00'35" E) with total geographical area 6,400 km<sup>2</sup> (Figure 1). There are five tehsils in district Kinnaur, namely Kalpa,

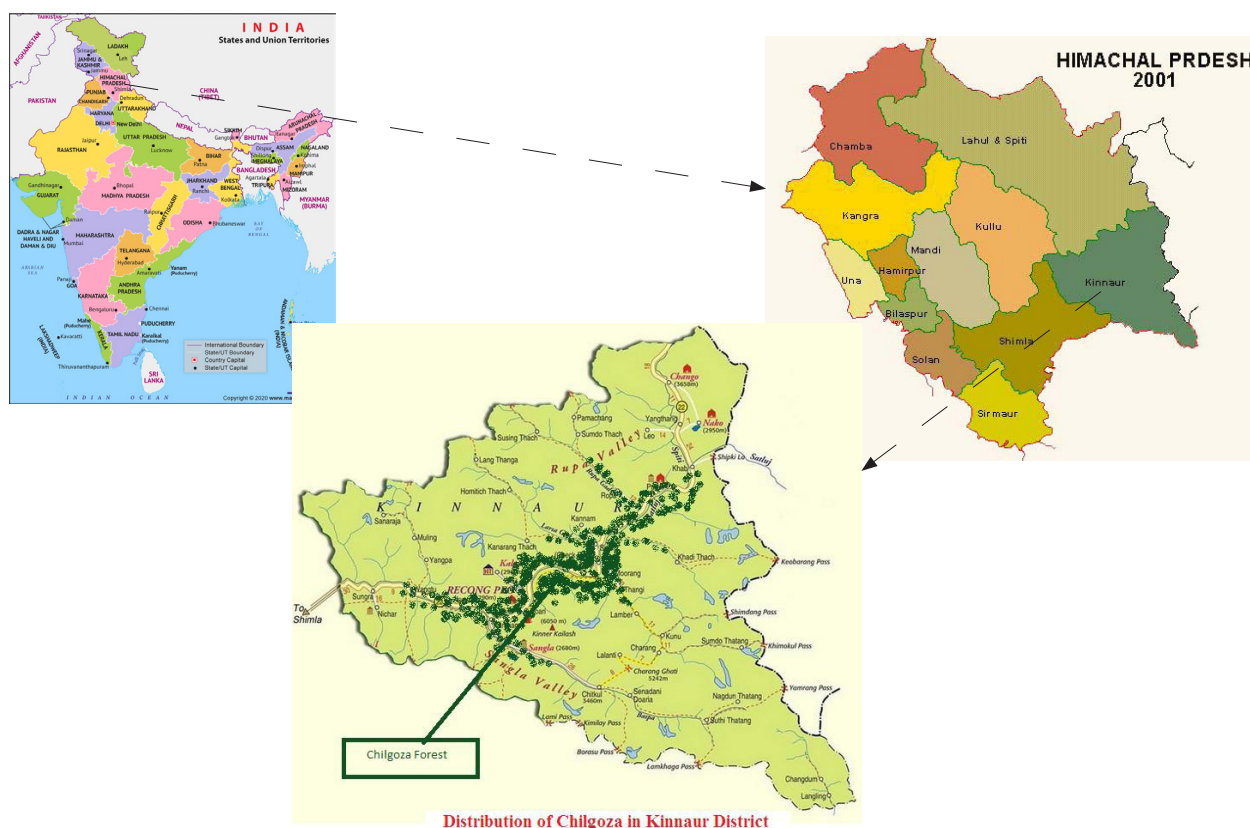


Figure 1. Kinnaur District in Himachal Pradesh and India.

Sangla, Morang, Pooh, and Nichar. The major soil types of the region are sandy loam and clayey loam. The climate of the region is dry temperate sub-alpine and alpine types, and the region is dominated by conifers and broadleaved species i.e., *Cedrus deodara*, *Pinus wallichiana*, *P. gerardiana*, *Alnus nitida*, *Acer caesium*, *Picea smithiana*, *Fraxinus xanthoxyloides*, *Betula utilis*, *Taxus wallichiana*, *Abies pindrow*, *A. spectabilis*, *Quercus semecarpifolia*, and *Q. ilex*, *Juniperus polycarpus* in dry temperate and sub-alpine zones and medicinal and aromatic plants and other herbaceous species in alpine region.

## Methods

Present study is based on extensive and intensive surveys conducted from 2017 to 2019 in the representative 16 tribal villages namely Rarang, Ribba, Rispa, Jangi, Moorang, Thangi, Lippa (Morang range), Nesang, Sunnam, Labrang (Pooh range), Pangi, Tangling, Barang, Telangi (Kalpa range), and Kilba, Urni (Kilba range) of Kinnaur forest division of district Kinnaur. From each village, 3–8 knowledgeable persons were interviewed and the names and other details of persons interviewed are given in Table 1. The informants included

men, women, youth and elders between the age of 29 and 78 years. These knowledgeable local persons were interviewed through semi-structured questionnaire. The questions were mainly for the information generation on indigenous uses and traditional practice of Chilgoza by Kinnaura tribal communities. For information generation, questions related to the Chilgoza were asked in local dialect and Hindi as well. Details of the indigenous uses and traditional practices of Chilgoza have been given under results. Plant specimens were also collected, dried by using routine botanical collection and herbarium techniques, identified and preserved (Jain & Rao 1997). Plant species voucher specimens (0012-18, 0013-18, 0014-18, 0015-18, 0016-18) have been kept in the herbarium of Himalayan Forest Research Institute, Shimla, Himachal Pradesh, India. The information was compiled, analyzed and documented.

## RESULTS AND DISCUSSION

*Pinus gerardiana* is an important conifer tree mainly occurs in dry higher and trans-Himalayan tract of district Kinnaur, Himachal Pradesh. Kinnaura tribes of district Kinnaur collect its nuts due to their economic and socio-cultural importance. Sale of the nuts contributes to the



annual income of most of the families of Kinnaur District and contributes significantly in fulfilling daily livelihood needs. The total production of Chilgoza in Kinnaur is 100–300 ton/year and approximate export value of its annual produce is around INR 150–450 million depending upon crop production (Peltier & Duffy 2009). In addition to nuts, other parts of this valuable tree are also used by the tribal communities in various household needs and to perform various religious and socio-cultural functions. The details of indigenous uses are given below.

**1. Timber:** The wood of Chilgoza pine is hard, tough, durable and used as timber. It is used for the construction of houses especially for roof thatching, flooring and central poles of kitchen and stairs, and preparation of wooden boxes which is used for storing fruits, grains, and other items.

**2. Fuel wood:** The wood is used as fuel wood throughout the year. After the seed extraction, dried cones are also used as fuel wood during winter season.

**3. Torch wood:** The wooden flakes of Chilgoza Pine are used as traditional torch wood known as 'Sang' (Image 1D). It is used for burning fire, night movements and irrigating fields during night. A special torchwood dance known as 'Sangpuling chasham' is also performed by the villagers of Ribba village on the occasion of festival of flowers known as 'Fulaich' where the festival is celebrated at district level. Villagers collect long resinous wooden flakes and arrange them into bundles by tying with twigs of *Indigofera heterantha* and in the midnight, they burn the top of the bundles and dance (Image 1G).

**4. Agriculture implements:** Logs are hard, resinous, water proof and immune to fungal attack and used for the preparation of agricultural implements, i.e., plough and yoke locally known as 'tal' and 'kol'. In older time, these were used for ploughing the agricultural fields, now few local farmers use it. Wood is also used as drains for irrigation purposes in agricultural fields and construction of small bridges over streams and nallahs. The small poles and branches are used for the fencing of agricultural and horticultural fields and overhead shed formation for cultivation of grapes and storage houses of dried grasses.

**5. Household items:** The wood is used for the preparation of traditional mortar and pestle known as 'kaning' and 'musling' and used for mashing grains, seeds, etc. In Kinnaur District, it is traditionally used for the extraction of oil from Apricot nuts, Walnut, and Chilgoza nuts. The small pieces of Chilgoza wood is used in preparation of 'takli' locally known as 'pankt' or 'koru pankt' which is used for spinning of wool by the tribal

communities during winter (Image 1E, F).

**6. Medicine:** Resin of Chilgoza Pine mixed with mustard oil is used to cure arthritis and swellings. Resin is used to cure cracked feet. The nuts are eaten raw as well as in roasted form to cure physical weakness, cough and cold. Seed oil is used to cure, body pain, eye problem, wounds, and ulcers.

**7. Traditional food and beverage:** The Chilgoza nuts are used as one of the ingredients for preparation of salted tea locally known as 'Namkeen cha or Chha cha'. After removal of seed coat, nuts are mixed with Walnut *Juglans regia* and kernels of Apricot *Prunus armeniaca*. The mixture is ground to make paste, and is used in preparation of nutritious salted tea (Image 1C). Nuts are also used as dry fruit in halwa and kheer preparation in festival occasions especially in Sazo festival (Image 1B).

**8. Detergent:** Previously, ashes of Chilgoza cones were used for washing cloths and kitchen utensils by the tribal communities.

**9. Farmyard manure:** The dried needles are collected by tribal communities from forest in large quantities during the month of September–October and used in the agricultural fields and orchards for mulching to retain moisture, protect top soil from erosion and improve soil fertility (Image 1A). The needles also used as bedding material in cowsheds of the cattle and decomposed needles are removed from the cowsheds and subsequently used as farmyard manure in agricultural fields and orchards. Tribal communities also collect cones and spread them in their agricultural fields. The decomposed cones help to soften the hard soil.

**10. Economic use:** Chilgoza nuts play a significant role in improving livelihood of the tribal communities. In the whole distribution area of Chilgoza in Kinnaur District every household of the tribal communities collect the Chilgoza in the months of September–October from adjoining forest areas. They earn money INR 1,500–1,800/ kg by selling the Chilgoza nuts locally and use it for fulfilling their daily household needs.

**11. Cultural uses:** Chilgoza is an important part of a marriage ceremony in Kinnaur District for generations. Seeds are used in preparation of garlands known as 'ree maling' which is used in performing various marriage rituals, and also offered to local deities, brides, grooms, family members, relatives and guests during wedding ceremonies as a token of respect and love. It is also used in various death ceremonies and offered to dead bodies before funeral as a symbol of homage to the departed soul. The branches of the Chilgoza Pine are also used for the preparation of welcome gate during the visit of dignitaries to the villages and marriage ceremonies. The

**Table 1. List of Kinnaura tribes interviewed in Kinnaur District of Himachal Pradesh.**

	Name	Age	Gender	Village	Forest range	Altitude (m); latitude & longitude
1	Chering Pur	78	M	Rarang	Morang	2,500; 31°36'06.58"N & 78°21'08.32"E
2	Upkari Devi	65	F	Rarang		
3	Jai Nand	42	M	Rarang		
4	Kabeer Singh	55	M	Rarang		
5	PushapLata	45	F	Rarang		
6	Maya Devi	49	F	Rarang		
7	Rajeev Rathore	34	M	Rispa	Morang	2,300; 31°34'47.6"N & 78°23'16.2"E
8	Shiv Ram	53	M	Rispa		
9	Lajvanti	47	F	Rispa		
10	Sharda Devi	47	F	Rispa		
11	Raj Bhagat	55	M	Rispa	Morang	2,400; 31°35'2.0"N & 78°21'50.0"E
12	Harnam Singh	67	M	Ribba		
13	Abhishek Negi	31	M	Ribba		
14	Bhag Narayan	66	M	Ribba		
15	Dan Bhajan	55	M	Ribba		
16	Suminder Singh	59	M	Ribba		
17	Hans Raj	38	M	Ribba		
18	Yogita	51	F	Ribba		
19	Narayan Singh	34	M	Ribba		
20	Rattan Singh	36	M	Jangi	Morang	2700; 31°36'12.2"N & 78°25'40.6"E
21	Rajinder Singh	44	M	Jangi		
22	Tenzin Zangmo	49	F	Jangi		
23	ChetanDorjee	55	M	Jangi		
24	PriyaKumari	45	F	Jangi		
25	Sita Devi	52	F	Jangi		
26	Chetan Dorjee	55	M	Morang	Morang	2,700; 31°39'19.8"N & 78°23'11.1"E
27	Dinesh Kumar	44	M	Morang		
28	Ghyan Kiran Devi	67	F	Morang		
29	Promila Kumari	35	F	Morang		
30	Chhering Palden	58	M	Morang		
31	Prem Singh	67	M	Morang		
32	Mal Jeet	58	M	Morang		
33	Kalyan Singh	66	M	Morang		
34	Padam Chand	46	M	Thangi	Morang	2,800; 31°33'58.4"N & 78°28'11.6"E
35	Daleep Singh Negi	65	M	Thangi		
36	Partiba	62	F	Thangi		
37	Indu	48	F	Thangi		
38	Ashok	62	M	Thangi		
39	Chering Tashi	43	M	Lippa	Morang	2,700; 31°39'27.15"N & 78°22'57.84"E
40	Geeta Ram	46	M	Lippa		
41	Indravati	39	F	Lippa		
42	ShyamLal	56	M	Lippa		
43	Sher Singh	60	M	Lippa		
44	GyalchenZangmo	62	F	Lippa		
45	Bogan Singh	44	M	Nesang	Pooh	2,700; 31°39'04.4"N & 78°30'13.4"E
46	Jaglender Singh	46	M	Nesang		
47	Susheel Kumar	40	M	Nesang		
48	Kamal Singh	50	M	Nesang		
49	Raghunath Singh	57	M	Nesang		

	Name	Age	Gender	Village	Forest range	Altitude (m); latitude & longitude
50	Padam Bhutil	55	F	Sunnam	Pooh	2,800; 31°45'36.26"N & 78°27'58.82"E
51	Prem Lal	45	M	Sunnam		
52	Jeeta Singh	42	M	Sunnam		
53	Terseem	43	M	Sunnam		
54	Tulsi Negi	55	M	Sunnam		
55	Rajeev Negi	39	M	Labrang	Pooh	2,900; 31°45'09.28"N & 78°37'55.8"E
56	Badri Sen	48	M			
57	Jagat Negi	49	M			
58	Sant Ram	29	M	Pangi	Kalpa	2,300; 31°35'19.4"N & 78°16'27.8"E
59	Dev Bhagat	29	M	Pangi		
60	Rajeshwari	50	F	Pangi		
61	Sant Ram	45	M	Pangi		
62	Durga Singh	49	M	Pangi		
63	Radha	34	F	Pangi		
64	Rajender Singh	36	M	Pangi	Kalpa	2,100; 31°31'35.4"N & 78°16'55.2"E
65	Premi Devi	55	F	Tangling		
66	Balbir Singh	61	M	Tangling		
67	Laxman Singh	40	M	Tangling	Kalpa	2,200; 31°30'42.48"N & 78°15'59.46"E
68	Gyatzin	38	M	Barang		
69	Pyarmani	37	F	Barang		
70	Parmila	60	F	Barang		
71	RadhaPyari	50	F	Barang	Kalpa	2,000; 31°31'33.77"N & 78°16'53.65"E
72	Basanti Devi	54	F	Telangi		
73	Vikram	37	M	Telangi		
74	Samat Bahadur	59	M	Telangi	Kilba	1,900; 31°30'44.5"N & 78°09'38.1"E
75	Jiu Chand	55	M	Kilba		
76	Nandesh Kumar	34	M	Kilba		
77	G.S.Negi	46	M	Kilba		
78	Jamna Geer	54	M	Kilba		
79	Chander Pal	53	M	Kilba	Kalpa	2,400; 31°31'41.56"N & 78°07'43.06"E
80	Kapil	31	M	Urni		
81	Veer badr	46	M	Urni		
82	Manohar	53	M	Urni		

fumes of needles are used for the purification of houses during child birth, marriages, festivals, etc. The garland made from Chilgoza seeds are used in various fairs and festivals, i.e., Ormig, Dyal, Suskar, Losar, Beesh, and Fulaich celebrated in various parts of Kinnaur District. In addition to this, it is important part of various rituals in festivals and other customary rituals performed all across the Kinnaur District of Himachal Pradesh (Image 2A,B).

The above mentioned cultural importance of Chilgoza Pine, clearly reflects that this tree is not only ecologically and economically important to the area but also forms important part of traditions and culture of the tribal communities. Although, Kinnaur is major producer and supplier of Chilgoza in the country, still

its forests need proper management. Since the sixties, Himachal Pradesh Forest Department has been facing the problem of Chilgoza Pine regeneration, and tried to overcome from this problem by carrying out plantation programmes. But, results were not satisfactory because of typical environmental conditions including soil of the region not allowing to survive. The present traditional practices for the collection of fuelwood, torchwood, agricultural tools, timber, cones for seeds, and manuring agricultural fields are mostly destructive and require awareness among the tribal communities for the sustainable utilization of this highly valuable multipurpose endemic species. Most of the people are not aware about the impact of excessive lopping which is causing heavy damage to the trees and also affecting



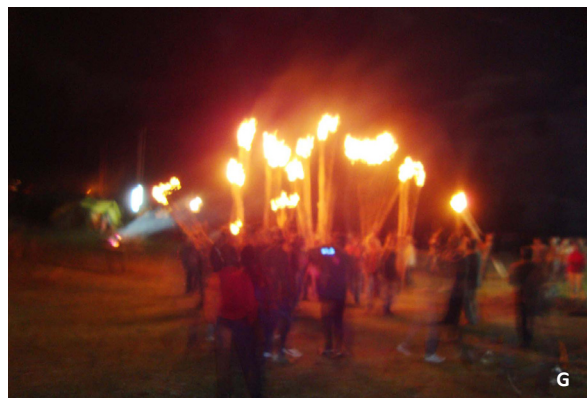


Image 1. (A–H) Utilization of Chilgoza pine by Kinnaura tribes of Kinnaur District: A—Chilgoza pine needle collection | B—Halwa preparation in Sazo festival | C—Local woman enjoying salted tea | D—Chilgoza torch-wood collection | E—Spinning of wool using “Koru- Pankt” | F—Spinning of wool using “Pankt” | G—Chilgoza torch-wood dance | H—Chilgoza fuel wood. © Swaran Lata.





Image 2. (A–B) Utilization of Chilgoza nuts in marriage ceremonies in Kinnaur district, Himachal Pradesh: A— Marriage ceremony in Kinnaur | B—Kinnauri brides and grooms wearing Chilgoza garlands. © Shiv Raj.

natural regeneration and cone production in successive years. In addition, intensive grazing, damage by insects and pathogens, birds, rodents and reptiles, conversion of Chilgoza forest into orchards and other developmental activities like construction of roads, buildings, and hydro-power projects are also affecting Chilgoza habitats and stand population. Such severe biotic interferences and lack of natural regeneration may result in rapid decline in the species population and continued such practices may lead the extinction of species in future. Keeping in view of its limited distribution, there is still considerable scope for increasing its yield and regeneration through sustainable harvesting and management of Chilgoza Pine forests. Therefore, it is of utmost important to

create awareness among the local communities about the conservation and sustainable utilization of the species. If the present trend of utilization continues, it will not only lead to the loss of all the services provided by this species but also, lead to soil erosion and overall change in the environmental condition. The loss of Chilgoza Pine and existing biodiversity will lead to drastic change in the ecosystem of the area, which may lead to various disasters in the fragile area. Therefore, population assessment and periodic monitoring using quadrat method for understanding the dynamics, sustainable harvesting of cones, and other parts of the species, ecological niche modeling for predicting the suitable area for in situ conservation, standardization

of propagation techniques for mass multiplication, establishment of nurseries, and plantation of seedlings in degraded forests, marginal lands and other suitable habitats with the help of tribal communities and forest department are suggested.

## CONCLUSION

*Pinus gerardiana* is one of the pioneer, native, endemic, multipurpose, and threatened species of district Kinnaur. It is not only important for maintaining the ecology of the region but, also for providing various ecosystem services to the tribal communities. This species is highly suitable for the typical topographical gradients and environment. Therefore, the conservation and sustainable utilization of this species would help in conserving the ecosystem, ecosystem services, livelihood options, traditional culture and customs and overall environment of the region.

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