MEDWIN PUBLISHERS
Committed to Create Value for Researchers

Journal of Natural & Ayurvedic Medicine
ISSN: 2578-4986

Cultivation, Collection and Conservation of Kutki (*Picrorhiza Kurroa* Royle Ex Benth.)

Rawat MS[1]*, Taledi K[2] and Chaubey S[3]

[1]M.D. Scholar, Department of Dravyaguna, Rishikul Campus, Ayurveda University, Haridwar, Uttarakhand, India

[2]M.D Scholar, Department of Panchkarma, Rishikul Campus, Uttarakhand Ayurveda University, Haridwar, Uttarakhand, India

[3]Professor, Department of Dravyaguna, Rishikul Campus, UAU, Haridwar

Research Article

Volume 6 Issue 4

Received Date: September 15, 2022

Published Date: October 04, 2022

DOI: 10.23880/jonam-16000363

***Corresponding author:** Manjeet Singh Rawat, P.G. Department of Dravyaguna, Rishikul Campus, Uttarakhand Ayurvedic University, Haridwar, Uttarakhand, India, Email: drmanjeetrawat12@gmail.com

Abstract

A number of rare, endangered, and threatened species of medicinal plants, including *Picrorhiza kurroa*, may be found in the state of Uttarakhand, which is situated in the foothills of the Himalaya. *Picrorhiza kurrooa*'s dried roots and stolons were used to make the picrosides I, II, III, V, and Kutkoside are responsible for its significant medicinal benefits. Due to the substantial demand on both domestic and foreign markets, this species is being exploited in the wild. In Western Himalaya (India), the conservation status of this species is either endangered or rare. The studies on this species genetic diversity and conservation have elevated its importance in recent years. The prime aim is to safeguard and sustain this species' evolutionary viability and to enhance the chances of its survival and persistence in a changing environment. This article gives a brief overview of the Garhwal Himalayan region's efforts to conserve this species through cultivation.

Keywords: Medicinal Plants; *Picrorhiza kurrooa*; Agro-techniques; Cultivation; Collection; Conservation

Introduction

The Garhwal Himalaya in Uttarakhand is home to a variety of vulnerable, threatened, and endangered medicinal and Aromatic plants [1]. Garhwal Himalaya's Alpine Zone provides a unique habitat for native and plants with significant medical values [2]. The vegetation in this region produces secondary metabolites and hence, provide more opportunities for having novel biomolecules and a greater number of the active components. The Scrophulariaceae family contains the significant medicinal plant *Picrorhiza kurroa* Royle ex Benth. The species is indigenous to Pakistan, China, Tibet, Nepal, India, and Bhutan. This species' native range in India is from subalpine to alpine terrain in the North-Western Himalayan range from Kashmir to Sikkim between 3000 and 5300 metres above sea level [3]. In three hill states of the Western Himalaya, namely Jammu and Kashmir, Himachal Pradesh, and Uttarakhand, its distribution have reported. *P. kurroa* thrives in both organic soils and damp, rocky hillsides. It favours muddy, cliffy mountains with deep fissures. The bitter root, which is employed in native medicine, is where the generic name originates [4]. Rhiza means root in Greek, whereas picros means bitter. *P. Kurroa* is a well-known herb in the Ayurveda and mentioned as an important remedy by *Kashyap, Charak*, *Shushrut, Vaghbhatt, Bhavmishra* etc. in ancient *Ayurvedic* literature. In small dosages, it is thought to be cholagogue, stomachic, laxative, and cathartic in larger doses. Prior to recently, *P. kurroa* was also listed as an official

drug in the Indian Pharmacopoeia (The pharmacopoeia of India, 1970). Since a very long time ago, the indigenous medical system has used *Kutki*; the name *"Kutki"* seems to have been derived from the *Sanskrit* word *"Katuka,"* which means bitter taste. There are various synonyms of the *P. kurroa- Kutki, Katuka, Tikta, Katui* - means bitterness of taste, *Krishnabheda* -means blackishness internally when broken, *Chakrangi*-means with circular scars. The earlier research literature says that its roots are really quite bitter and that the locals utilise them as medicine.

It is either used as substitute or as an adulterant of Indian Gentian (*Gentiana kurroo*). It has a slight and unpleasant smell. Taste is very bitter and long lasting. Iridoid glycosides such as picrosides I, II, III, V, and kutkosides [5] as well as other known active ingredients such as apocyanin, drosin, and curcubitacins [6] are responsible for Kutaki's medicinal properties. Both the modern pharmaceutical industries and the Indian System of Medicine (ISM) commonly use it. It is regarded as a valuable tonic and blood purifier in traditional medicine and has also been used to cure hepatitis, abdominal pain, stomach disorders, anaemia, jaundice, and to promoting bile secretion [7]. Iridoid content of *P. kurrooa* has been associated with a wide range of biological actions, including antihepatotoxic, choleretic, anti-inflammatory, anticancer, antiviral, antioxidant, and leishmanicidal effects [8]. Candida albicans was used as a test subject for the alcohol extract of *P. kurrooa's* antifungal properties. Significant activity against the fungus was shown by the Kutki extract and its main constituents [9].

Since past few decades for illegal collectors, exploitation of this species has suddenly become a flourishing business. This uncontrolled exploitation, along with other issues including habitat destruction, overgrazing, and tourism interference, is responsible for the declining status of this important species, especially in higher altitudes.

The species was one of 37 designated as the top priority species for conservation and cultivation in the Western Himalaya because of its narrow distribution range, small population size, high use value, and rising demand. The International Union for Conservation of Nature and Natural Resources has categorised the plant as an endangered species, however its status in the wild is at risk due to indiscriminate, uncontrolled harvesting and a lack of organised cultivation [10]. Both Himachal Pradesh and the Garhwal and Kumaun Himalaya have reported herb depletion [11,12]. *P. kurroa* was given an endangered status in J&K and H.P., while its status in Uttarakhand was declared as critically endangered, during a Conservation Assessment and Management Prioritization workshop for medicinal plants of Northwest Himalayan states Jammu and Kashmir, Himachal Pradesh, and Uttarakhand held in Shimla in 2003.

Cultivation

The climate in the Garhwal Himalaya is ideal for growing significant high-altitude medicinal plants, and recently several industries have been established to promote products made from medicinal plants, and in this way farmers see it as a potential source of income enhancement over conventional farming. Cultivating medicinal plants will certainly reduce pressure on the population of wild medicinal plants, maintain a steady supply of raw materials for industry, and boost the livelihoods of local farmers. Promote cultivation activities by training farmers, setting up nurseries to propagate and supply planting material to farmers, developing and disseminating cultivation technologies, educating farmers about the potential of medicinal plants as cash crops, and offering loans and subsidies related to the cultivation of medicinal plants.

Morphological Variants

Two morphological variants of *P. kurroa*, known as the narrow leaf (NL) and wide leaf (BL) variants, have been reported in the Garhwal Himalaya at various elevations between 2700 and 4500 metres above sea level. Broad leaf variant grows rapidly and shows better rate of multiplication through stolon cuttings instead of cultivation through seeds at different altitudes. Based on morphological analysis characteristics like leaf length, leaf width, and leaf number, number of capsules per plant, number of flowers, and number of seeds per capsule and overall plant seed production, the superiority of the broad leaf variant over the narrow leaf variant have been found [13]. Potential for multiplication, growth, yield, and active ingredients were observed to be more abundant in the BL variant in both cultivated and natural conditions [13]. Concentration of biochemical constituents like carbohydrates, soluble proteins and free amino acids, seed Peroxidase isoenzyme, Concentration of Picrotin and Picrotoxin were found higher in broad leaf variant.

Development of Agro-Techniques

The agricultural techniques for successfully cultivating and conserving *Kutki* in its natural habitats at lower altitudes were developed by Nautiyal and Nautiyal [14].

Means of propagation: In nursery beds made of Styrofoam, the species was propagated through seeds and stolons.

Soil requirement: *P. kurroa* grows best on sandy textured loamy soil that is high in organic carbon, has a thick layer of humus or litter, and has a high moisture content.
Additionally, locations that are somewhat shaded and have a canopy of small shrubs produce the most.

Time of sowing the seeds and growth behaviour: In greenhouses, seedlings are planted in November and December; in beds at lower elevations, in March and April; and in the alpine region, in May. When seeds were sown on the top layer of soil in Styrofoam seedling trays and coated with a thin layer of dry moss powder, excellent germination was observed. By cultivating seedlings at lower elevations in the winter and transplanting them at higher altitudes in the spring, the harvesting period can be shortened by at least six months [15].

Propagation through stolon cuttings: Propagation through stolon cuttings proved more successful for multiplication as well as for higher production within a short period of time than cultivation through seeds.

Transplanting and optimum spacing: seedlings or stolon cuttings are planted 30 cm apart.

Intercropping system: *Kutki* grows well when interplanted with *Foeniculum vulgare*, *Solanum tuberosum*, and *Digitalis purpurea* because these plants provide a favourable microclimate for greater growth by retaining moisture for longer periods of and shade for *Kutki*.

Nutrient requirement: It has been found that soil treated with a higher litter concentration is more suited to increase production. For higher growth and yield, forest litter is proven to be more suited. It is advised to Manuring over the winter or just before transplanting.

Water management and weed control: Both seedlings and stolon cuttings need watering every 24 hours during the early developmental stage. Watering should be done after the two-day gap in the winter. Time spent weeding and hoeing varies depending on the soil. During the first year of cultivation, weeding is often done every week, and during the second and third years, weeding is typically done every month.

Crop Maturity and Optimal Harvesting Window

Following the reproductive phase, the plant is ready for harvest and has a significant amount of active contents. Time of completion of reproductive phase depends on the altitude. Plants are typically grown in alpine regions. The months of conclude their reproductive phase. September through October, when lower-altitude flora are in bloom the month of September finish their reproductive phase.

Collection of *Kutki* Stolons and Roots

Stolons and roots are harvested, washed to remove soil, and dried afterward. Drying stolons and roots at room temperature (15 to 25 °C) in the shade produces a significant concentration of picrotin and picrotoxin. Drying in an oven or in direct sunlight quickly depletes the active ingredients.

Storage

Preservation of crude drugs needs sound knowledge of their physical and chemical properties. To maintain the good quality of drug, it should be stored in the premises, which are waterproof and rodent proof. The dried material should be stored in cool dry places. Airtight, moisture proof and lightproof containers should be used in place of wooden boxes and paper bags.

Conservation of *Kutki*

Conservation strategy (IUCN, UNEP & WWF, 1980) defines conservation as "the management of human use of the biodiversity so that it may yield the greatest sustainable benefit to present generation while maintaining its potential to meet the needs and aspirations of future generations".

Strategies for Conservation of Medicinal Plants w.r.t. Kutki

The conservation of the wild medicinal plants or any other such threatened species can be tackled by scientific techniques as well as social actions. There are basically three scientific techniques of conservation of genetic diversity of these plants.

- Legislation
- *In-situ* conservation
- *Ex-situ* conservation

Legislation: There are no separate policies or regulations for conserving medicinal plants growing in forests in India. There conservation is covered under existing laws pertaining to forestry. Following are the laws formulated by government of India for conservation of forests which directly or indirectly protects the wild herbal flora.

- Forest Act, 1927
- Wildlife (Protection) Act 1972 and Wildlife (Protection) Amendment Act 1991
- Forest (Conservation) Act, 1980
- Environment Protection Act, 1986
- National forest policy, 1988
- National biodiversity act, 2002

The scheduled tribes and other traditional forest dwellers act, 2006

***In-situ* conservation**

- In-situ conservation refers to the conservation of a specific species in a habitat where it naturally occurs.
- Gene banks, gene sanctions, biosphere reserves, national parks, sacred sites, sacred grooves, etc. are all included.
- Only in nature can plant diversity be preserved over the long term at the genetic, species, and eco-system levels.
- Inter- and intra-specific genetic variety must be

preserved in discrete, representative biogeographic zones.

The most efficient method of preserving the genetic and biological diversity that already exists is through "in-situ" or "on-site" conservation, which involves preserving a wild population of a particular species or stock of a biological community in its natural habitat. Instead of focusing on individual species, such "ecocentric" strategy has the potential to protect all species from extinction before it happens by reducing the need for human intervention. Examples of "in-situ" methods of conservation include the establishment of biosphere reserves, national parks, wildlife sanctuaries, sacred groves, and other protected areas.

Ex-Situ Conservation: Ex-situ, or outside of their natural habitat, conservation of medicinal plants is possible through the cultivation and maintenance of plants in botanic gardens, parks, and other suitable locations, as well as through the long-term preservation of plant propagules in gene banks (seed banks, pollen banks, DNA libraries, etc.), plant tissue culture repositories, and by cryopreservation.

Ethno-Medicinal Uses of *P. kurroa*

The species is valued by the locals for treating illnesses including stomachaches and high fevers. Adults who have stomachaches are given a 10 grams dose of a mildly boiled root decoction flavored with honey, as well as the remedy for fever the adult patient is given 10 grams of root power along with 1 gram of black piper and honey. Infants are advised to consume 0.5 gram of Kutki powder with mother's milk to treat stomachaches.

Conclusion

The low relative density of the species in almost all of the population indicates the urgent need for immediate plant conservation. Due to the species' narrow ecological range, it is not quite certain that it can survive ex-situ, making in-situ conservation the safest option. The path to the species' reintroduction will be paved by the identification of the species' preferred habitats, altitudinal range, and elite populations with respect to below-ground biomass.

Furthermore, raising locals' awareness about the value and uses of the plant as well as restricting overexploitation of species from their natural habitats are crucial to maintain the important medicinal flora.

References

1. Nand N, Kumar K (1989) The holly Himalaya a geographical interpretation of Garhwal. Daya Publishing House, Delhi, pp: 125-127.

2. Dhar U, Rawal RS, Upreti J (2000) Setting priorities for conservation of medicinal plants – A case study in the Indian Himalaya. Biological Conservation 95(1): 57-65.

3. Chettri N, Sharma E, Lama SD (2005) Non-timber forest produces utilization, distribution and status in a trekking corridor of Sikkim, India. Lyonia 8(1): 89-101.

4. Royle JF (1839) Illustrations of the botany and other branches of the natural history of the Himalayan Mountains and of the flora of Cashmere. Today & Tomorrow's Printers & Publishers, New Delhi, pp: 290-291.

5. Jia Q, Hong MF, Minter D (1999) Pikuroside: a novel iridoid from *Picrorhiza kurrooa*. Journal of Natural Products 62(6): 901-903.

6. Stuppner H, Wagner H (1989) New cucurbitacin glycosides from *Picrorhiza kurrooa*. Planta Med. 55(6): 559-563.

7. Sharma PK, Thakur SK, Manuja S, Rana RK, Kumar P, et al. (2011) Observations on traditional phytotherapy among the inhabitants of Lahaul Valley through Amchi system of medicine-A cold desert area of Himachal Pradesh in North Western Himalayas, India. Chinese Medicine 2: 93-102.

8. Ghisalberti EL (1998) Biological and pharmacological activity of naturally occurring iridoids and secoiridoids. Phytomedicine 5(2): 147-163.

9. Mandloi D, Agrawal A, Goyal S, Wadhwa S, Patel R, et al. (2010) Anti-fungal potential of alcoholic extract of *Picrorhiza Kurrooa.* Pharmacol 3: 882-885.

10. Nayar MP, Sastry ARK (1997) Red Data Book of Indian Plants. Vol. 1-3, Botanical Survey of India, Culcutta, India.

11. Shah NC (1975) Prospects of botanical drugs from hill districts of Uttar Pradesh. Ind Drugs 12: 17-20.

12. Chauhan NS (1998) Endangered ayurvedic pharmacopoeial plant resources of Himachal Prades. In: Kaushik P (Ed.), Indigenous medicinal plant including microbes and fungi. Today and Tomorrows Printers, New Delhi, pp: 350.

13. Chand D (2014) Morphological and Biochemical variations between broad and narrow leaf variants of *Picrorhiza kurrooa* Royle ex. Benth under natural and cultivated conditions. M.Phil Thesis, HNB Garhwal University, Uttarakhand.

14. Nautiyal MC, Nautiyal BP (2004) Agrotechniques for high altitude medicinal and aromatic plants. Silver

Jubilee Publication of HAPPRC, Bishen Singh Mahendra Pal Singh, Dehradun.

15. Nautiyal MC (1985) Indigenous medicinal plant symposiu. Today and Tommorrow's Printers and Publishers, New Delhi, pp: 107-112.