



Picrorhiza kurroa (Kutki): An Endangered Medicinal Herb of Alpine Himalayan Region

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Picrorhiza kurroa is one of the most important endangered medicinal plants of Alpine Himalayas with extraordinary medicinal properties. It belongs to Scrophulariaceae family and commonly called as Kutki. *Picrorhiza kurroa* is also called as bitter drug due to presence of Kutkin, principle phytochemical constituent of this medicinal plant. The word picrorhiza is derived from Greek word "picros" means bitter, while "rhiza" means root, thus called bitter root (Coventry, 1984). The use of this drug is known to be in medicine since 5000 years ago and is mentioned as an important remedy in Ayurvedic system by (Kashyap, 1970) and (Charak, 1949). This herb is known for hepatoprotective action with wide range of pharmacological activities. In Ayurveda it balances kapha and pitta which may cause digestive problems, acidity and fat. In addition, it may manage various problems like diabetes, increased level of urea, creatinine, heat and hyperthyroidism. Extensive harvesting and limited cultivation of *Picrorhiza kurroa* has threatened its natural presence and has been listed as "critically endangered" species by IUCN. The plant has also been included in the Appendix II of CITES. To conserve this endangered plant, it is necessary to restrict over exploitation from the natural habitats and follow sustainable harvesting practices. Cultivation is a viable option that will certainly reduce pressure on its wild populations, maintain a steady supply of raw materials for industry and boost the rural livelihoods.

Taxonomic classification

Scientific name: *Picrorhiza kurroa*

Kingdom: Plantae

Order: Lamiales

Family: Scrophulariaceae

Genus: *Picrorhiza*

Species: kurroa

Part used: Root and Rhizome

Distribution

The species occurs in alpine Himalayas, from Kashmir to Kumaun, Garhwal and Sikkim between 3000 m and 4500 m altitudes (Chettri *et al.*, 2005) (Fig.1). It is common in the mountainous regions of Himachal Pradesh, including Chamba, Pangi, Kullu, Shimla, Kinnaur, and Lahaul valleys. *Picrorhiza kurroa* thrives on soils that are rich in organic matter and are wet, sandy, clay loam-textured.



Fig.1: *Picrorhiza kurroa* (kutki) in natural habitat.

Medicinal uses of *Picrorhiza kurroa*

It has been used for many years in Ayurvedic medicine to treat severe diseases and scientific studies have supported its therapeutic benefits. It has been found to possess hepatoprotective, antioxidant, anti-inflammatory, immunomodulatory properties along with antiallergic, anti-cancer, antiasthmatic, anticancerous, cardiovascular, choleric, hypoglycemic, hypolipidemic, antiviral, antimalarial and purgative activities. Its underground part has been used traditionally for asthma, bronchitis, malaria, chronic dysentery, viral hepatitis, upset stomach, scorpion sting, as a bitter tonic (stimulating the appetite and improving digestion) and as a liver protectant. Besides, it has been used in the treatment of psoriasis, eczema, other skin problems, peptic ulcer and neuralgia, vitiligo and rheumatic arthritis.

Ethnobotanical utility

Local farmers utilize this species to treat illnesses, including persistent diarrhoea, fever, liver ailments and stomach aches. Further, mildly boiled root decoction with honey flavouring in ten g of concentration is given to treat stomach aches (Kaul and Kaul, 1996). Additionally, ten g of root powder mixed with one g of black pepper and honey are given to treat fever in adults while, for infants one-fourth g of Kutki powder mixed with mother's milk is given to treat stomachache. Kutki provides a variety of possible medical advantages and when used as prescribed by a doctor, it is thought to be safe. However, it should not be taken without first seeing a healthcare professional since, like any medical herb, it may interact with some medication.

Cultivation

Propagation: *Picrorhiza kurroa* is typically grown from seeds, rhizome and terminal portion of stolon. It is vital to cultivate and reproduce this commercially important plant in order to reduce pressure on its natural stocks. This ensures a consistent supply of raw materials for industry and also improves the quality and efficacy of the drug. Vegetative propagation has been proved to be a successful method for multiplication within a short period of time than cultivation through seeds.

Process of vegetative propagation

Selection of stolon fragment with two to three complete nodes.

Top segments of stolons are found more suitable than middle and lower segments.

The planting stock can be raised in polybags, trays and mother beds.

Application of growth hormone like GA₃ for better rooting and field establishment.

Transplantation of rooted plants at appropriate distance in main field.

Land preparation and plant density

For the endangered species to flourish and develop further, the required region must have the right and clearly defined agricultural practices. Fertilizer application and land preparation are the main factors involved in this. In order to facilitate the horizontal spreading of rhizomes, the soil that is chosen for cultivation should be tilled, rendered friable and porous by repeated ploughing. The field should also be left open for approximately a week so that the solarization process may occur concurrently. Forest leaf litter and well-decomposed farmyard manure are appropriately combined with the soil in an ideal quantity of 6 tonnes/hectare at least 15 days prior to transplanting. The plants must be spaced correctly and transplanted when the mixing procedure is finished. As a result, it is currently necessary to plant around 110000 plants, which are spaced 20 cm apart from one another or 30 cm apart from another. After the first growth season, by using good agronomic techniques, the density of plants could reach 300,000.

Insect pest, disease and management

Insect pest management uses both chemical and non-chemical techniques to keep insect populations under control and away from levels that might be detrimental to the economy. Early development phases (March–May) are when powdery mildew infection is most noticeable at lower elevations (1800–2500 m). This infection can be treated by spraying Topsin-M (thiophanate methyl 0.1%) approximately 15-20 days after commencement, followed by another spray 15 days later. Additionally, this disease is seen after excessive manuring. To avoid seed loss due to aphids and insects, pesticide (eocalux, 0.5%) spraying is also necessary twice within a 10-day period at the time of seed production and blooming.

Harvesting and post-harvest management

The *Picrorhiza kurroa* has a three-year life cycle. After blooming is over, the fruit-bearing stage begins in the month of August and lasts until the month of September. When the aerial parts and shoots start to dry out and wither in September, the roots and rhizome are harvested. Vegetatively grown plants mature almost one year earlier than those raised from the seedlings. However, to get higher active contents, plants must be collected before flowering occurs. The harvested stolons and roots are cleaned to remove any remaining soil particles before being dried in the shade at room temperature (15 to 25 °C) in order to ensure quality. Since, the active content depletes more quickly when dried in an oven or under direct sunlight.

Storage

After complete drying, the roots and stolon are packaged in airtight polythene that is sealed in jute bags to guarantee good protection from the moisture. By keeping the product in rodent and water-proof storage areas, the product's quality is preserved. It is necessary to store the finished product in a cool, dry area.

Yield

The plant gives about 11 quintals/hectare of dry roots and rhizomes in the third year when the crop is raised through rhizomes.

Future research and thrust

Ayurveda and the other pharmaceutical sectors are dependent on this endangered medicinal plant present for future research. Kutki is a well-known and substantial source of medicine and over 90% of the market demand for this species is met from the wild. Collecting and selling of kutki from forests is an important source of income and employment for many poor people who live in or adjacent to forest regions (Hamilton et al., 2008). The government has also implemented various measures to aid in the production and preservation of this

important medicinal plant species. Further, there is difficulty in management with planting material, irrigation systems, trade and transportation facilities, thus several government agencies and non-governmental organizations (NGOs) are participating in Kutki agriculture practices in a number of sectors and supplying land and other amenities. Some groups like "ANKUR" have started growing kutki in collaboration with other farmers on a cost benefit sharing basis. This has helped many farmers as they sell tonnes of kutki each year to fulfill the demand for their daily requirements. These farmers also earn lakhs of money each year from the cultivation of kutki. However, kutki is being exploited illegally from wild and the government needs to stop this by enforcing strict laws and taking other measures (Muhammad *et al.*, 2006). Additionally, in order to strengthen the medicinal plant industry and research institutions, the cultivation sector along with numerous agriculture support organizations must step forward. This will increase plant cultivators' knowledge of proper cultivation techniques.

At very high-altitude stations, efforts are also made to develop a package of agro-techniques that are friendly to farmers. Therefore, the *in-situ* conservation of threatened plant species like *Picrorhiza kurroa* will only be possible through the demonstration of propagation techniques and the distribution of elite propagules to farmers rather than through commercial cultivation.

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