



TRADITIONAL USES AND CONSERVATION OF *FRITILLARIA ROYLEI* HOOK. A CRITICALLY ENDANGERED HIMALAYAN MEDICINAL PLANT: AN OVERVIEW

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ABSTRACT

The ecosystems found in the Himalayan region have a wide variety of plants and animals, including valuable species of medicinal and aromatic plants (MAPs). Among them *Fritillaria roylei* Hook. commonly known as Kakoli, Jungli lehsun belongs to the Liliaceae family; perennial plant known for its medicinal value worldwide and is at risk of becoming endangered. It is typically found in the sub-alpine to alpine areas of the Himalayas, primarily growing on open and sunny slopes. *F. roylei* has been reported in Jammu & Kashmir, Uttarakhand, Himachal Pradesh, along within the altitudinal range of 2400-4000 m.a.s.l. It thrives on well-drained, acidic soil that is light sandy or medium loam. The open sunny areas with moderate slope and having rich humus are the habitats preferred by this species. It has been traditionally used by local communities in various way ie. dry powder, paste etc. The bulb of this species been widely used for the treatment of bronchitis asthma, burns, health tonics and stomach troubles. It is a significant component of Ashtavarga (a set of eight medicinal herbs), Chyavanprash, and other Ayurvedic formulations in the Indian medical system. The roots are used for healing wounds, corns in Ayurvedic and Unani medicine. *F. roylei* are utilized worldwide as medication and food; normally roasted bulbs of this species are utilized as food by Native Americans (Orhan et al. 2009). The bulbs of *Fritillaria roylei* utilized as decoction or in dried form to cure bronchitis, cough, tumors, asthma, hemoptysis and insufficiency of milk (Perry 1980; Kang et al. 2002). Bulbs can be used whole or ground into a powder to relieve congestion in the lungs and provide a cooling effect. It has been utilized for the treatment of prolonged hypotension, sensory system, defective breathing and incitement of the heart muscle (Erika and Rebecca 2005) in addition to managing subcutaneous swelling, such as breast nodules and scrofulous swellings (Da-Cheng et al. 2013). However, due to high demand, the species has gained significant market value worldwide leading to unsustainable collection practices and a decline in its wild populations. This communication highlights concerns about the rapid decline of *Fritillaria roylei* population in Himachal Pradesh, Uttarakhand, and Jammu and Kashmir and by making suitable conservation strategies along with sustainable utilization are earnestly undertaken. Given its medicinal importance, it is crucial to prioritize the conservation of *Fritillaria roylei* through various methods. These include identifying areas for the conservation of medicinal plants, both in their natural habitats (in-situ conservation) and through propagation and multiplication outside their natural habitats (ex-situ conservation). It is also important to strengthen biodiversity management committees, raise awareness among key stakeholders, and promote sustainable harvesting practices to ensure the long-term survival of *Fritillaria roylei*.

Keywords: Traditional uses, Endangered, Medicinal, Conservation, North-Western Himalaya

INTRODUCTION

There are 100 species in the genus *Fritillaria* (Liliaceae), six of which are found in India, and they are all found in the northern temperate zone ((Anon., 1956, Mabberley, 1987). *Fritillaria roylei* is amongst 36 species of significant medicinal plants of western Himalayas. The bulbs of the herb are important constituents of Astavarga, Chyavanprash, Ghritam, Mahatraiphala, Jeevanthyadi, Ghrutham and Danwantharam Thailam. The bulbs are important constituent of the Indian System of Medicine (ISM), health tonic, Astavarga Group (a combination of eight rejuvenating drugs) and aayurvedic medicines (Anon., 1956). This plant found in sunny meadows of sub-alpine to alpine locations between 3000 and 4200 m, like in Garhwal Himalaya (Chauhan et al., 2011), *Fritillaria roylei* Hook., also known as *Kakoli* (Anon., 1956).. The International Union for Conservation of Nature (IUCN) categorized the species as critically endangered (CR) for Uttarakhand and endangered (EN) for Himachal Pradesh and Jammu and Kashmir (Anon., 2003). The market demand of this species is increasing while supply is gradually decreasing (Ved and Goraya, 2008). This calls for the implementation of conservation and cultivation measures. According to South East Asian and Turkish folklore (Farooq et al. 1994), *Fritillaria* is considered a prominent genus within the Liliaceae family and a botanical source of vital chemical components used in traditional prescriptions (Zhou et al. 2010) Japan, China, and Pakistan (Kaneko et al. 1981). Nowadays, *Fritillaria* species are widely used in floriculture and the therapeutic plant industries (Day et al., 2014; Turktas et al., 2012). *Fritillaria* is used as food and medicine all over the world; Native Americans usually eat the roasted bulbs of some species. Due in large part to their commercial value—partially as decorative plants, but mostly as a source of materials for use in traditional medicine—fritillaria species have drawn a lot of attention (Day et al., 2014).

Botanical Description of *Fritillaria roylei*:

The perennial herb *Fritillaria roylei* is glabrous, bulbous, and grows to a height of 15 to 60 cm. Its stem is mottle. The leaves are opposite or whorled, linear-lanceolate, flowers are solitary, nodding and yellowish-green to brownish-purple with chequered pattern in yellowish-green or dull-purple. Bell-shaped flowers are borne individually on the stalk, occasionally in groups of two or more, and hang with their heads pointing downward. Petals are narrow ovate 4-5 cm long. The linear, lanceolate, frequently

long-pointed leaves are 5–10 cm long and are grouped oppositely or in whorls of two to six. June through July is flowering season, while July through August is fruiting season. In every valve, there are two rows of seeds. Bulbs are globose, small and covered with membranous scales. The species is adapted for a brief season (April–September) during which the vegetative and reproductive phenophases are completed. The seeds contain deep morphophysiological dormancy (Muraseva, D.S et.al.2015).

Distribution in Western Himalaya:

In Western Himalaya, *F. roylei* is distributed from Kashmir, Uttarakhand, Himachal Pradesh and within the altitudinal range of 2400-4000 m a.s.l.(Chauhan et. al.) while, in Uttarakhand it is also reported between 2800-4000 m a.s.l.(Kala, C.P., 2005) And in Himachal Pradesh it is found between 2400-4400 m.a.s.l. It thrives on well-drained, acidic soil that is light sandy or medium loam. *Fritillaria roylei* like to live in open, sunny places that have a moderate slope and good humus. In Uttarakhand, it is found naturally in different alpine meadows such as Kedarnath, Rudranath, Valley of flowers, Dayara, Dronagiri and Tungnath and in Tehri district. In Jammu and Kashmir, the herb was found in Minimarg and Gurez valley. In Himachal Pradesh it is found in Churdhar wildlife sanctuary in Sirmour district, Shikari Devi wildlife Sanctuary in Mandi district, Kugati wildlife sanctuary, Saichu nala wildlife sanctuary in Chamba, GHNNP Kullu, Parvati Valley in Kullu district, in Chitkul and Sangla of Kinnaur district and Chansal Pass in Shimla district.

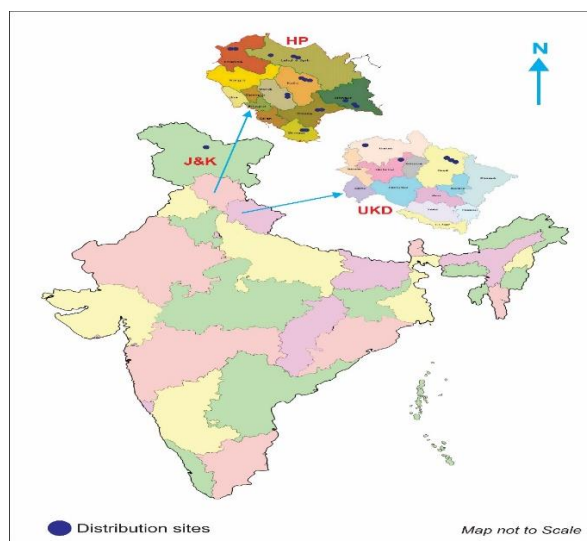


Fig 1 : Distribution of *Fritillaria roylei* in north western Himalaya.



Traditional Uses:

Fritillaria have been utilized as main Chinese crude drugs and furthermore as an anti-hypertensive and anti-asthmatic drugs from years. Around the world, *Fritillaria* are used as food and medicine; Native Americans typically eat the roasted bulbs of some species (Orhan et al. 2009). The bulbs of *Fritillaria roylei* are used traditionally in the treatment of bronchitis, asthma, burns, and stomach troubles and as a stimulant. The roots are used for healing wounds, corns in Ayurveda and unani medicine. Prior it was transported from Nepal to India and China because of its great therapeutic properties (Thomson 2007). The Genus *Fritillaria* has been used for a very long time because of its ability to relieve phlegm, moisturize the lungs, remove heat from the body, calm coughs, and treat coughs caused by heat in the lungs and dryness, a cough because of a yin weakness, sputum with blood and allow sputum dry cough. In Jammu and Kashmir, India, *F. roylei* has long been used as a tonic, for rheumatism, asthma, and tuberculosis. The species' bulb is boiled with orange peel and used to cure asthma and tuberculosis. The bulb part of *Fritillaria* species utilized as decoction or in dried form to cure bronchitis, cough, tumors, Struma, asthma, hemoptysis and insufficiency of milk (Perry 1980; Kang et al. 2002). It is also believed that *F. roylei* is very strong cough suppressant and source of expectorant drug in traditional Chinese medicine. Moreover, it is used as a lymphatic decongestant to decrease glandular or nodular breast tissue, goiter, swellings and lymphadenopathy. It has been used to treat swelling under the skin, such as scrofulous swellings and breast nodules, as well as prolonged hypotension, sensory system dysfunction, poor breathing, and heart muscle stimulation (Erika and Rebecca 2005). The bulbs play a significant role in the Chinese medication Szechuan-Pei-Mu, which is used as an expectorant, lactagogue, and antipyretic. In Pakistan, the powder of dry bulbs mixed with butter is used to treat urinary tract infections and to soften and soothe the skin (Khan et al 2013). The bulb of the species is also useful in the treatment of fever, hemorrhage and milk deficiency (Kaul 2010).

CONSERVATION

Although *F. roylei* has been declared endangered there has been no management plan for its conservation to date

except for a ban on collection from natural populations. However, illegal and destructive harvesting is reported for few alpine medicinal plants (Kala 2005; Ved and Goraya 2008). Even after collection of this species from the wild was banned, destructive harvesting continues illegally because collection of medicinal and aromatic plants (MAPs) is associated with the socioeconomic of the various region of Himalayan states. Cultivation of such MAPs should be initiated to improve the socioeconomic because *F. roylei* showed good seed germination under laboratory conditions. The sale of medicinal herbs generates more income than traditional crops in Uttarakhand (Sileri and Badola 2000). Although cultivation cannot substitute the urgency of conservation of natural populations of MAPs, it can help in meeting the industrial demand and reduce pressure on wild stocks (Tyagi 2005). In situ and ex situ conservation methods with systematic planning will also be useful for such economically important endangered MAPs. On the basis of such multifaceted information on specific species, future conservation strategies and cultivation of wild MAPs can be initiated. It can be concluded that priority should be given for restoration of *F. roylei* to protect it urgently in its natural habitat. Otherwise, rising demand with shrinking habitats may lead to local extinction of many MAPs, including *F. roylei*.

Conclusion:

A prerequisite should be to prioritize the in situ conservation of the plant and its ex-situ cultivation, given its critically endangered status and the great demand for its medical properties. The current stock of this species in its natural habitats should be quantified through population assessment using accepted ecological techniques. Collecting illegally and without scientific validity from natural areas need to be banned completely. These tactics will be helpful in maintaining this potential herb's supply and conservation.

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Figure 2: a, b: Collection of bulbs from natural habitats. c: Seeds of *F. roylei* d. Flowering plant of *F. roylei*.

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