

Ecological status, traditional knowledge and conservation status of *Gentiana kurroo* Royle, a critically endangered medicinal plant in Kashmir Himalaya, India

Nazir Ahmad Najjar

Department of environmental biology, Awadhesh Pratap Singh University,
Rewa-486003 (India)
email : nazirnajjar45@gmail.com

Abstract

Kashmir Himalaya harbours a number of medicinal plants. A large number of medicinal plants of Kashmir Himalaya are being used extensively from their natural habitats. *Gentiana kurroo* is one of the most important medicinal plant of Kashmir Himalaya which is being used continuously from the ages by the local indigenous people of the region. This medicinal plant is especially useful in states of exhaustion from chronic disease and in all cases of debility, weakness of the digestive system and lack of appetite. It is one of the best strengtheners of the human system, stimulating the liver, gallbladder and digestive system and is an excellent tonic to combine with a purgative in order to prevent its debilitating effects. The root is anthelmintic, anti inflammatory, antiseptic, better tonic, cholagogue, emmenagogue, febrifuge, refrigerant, stomachic. It is taken internally in the treatment of liver diseases; gastric infections. The root is harvested in the autumn and dried for latter use which is rich in medicinal properties. Ecological information of *Gentiana kurroo* was collected by using random quadrants in a random sampling technique in Khrew hills in Kashmir Himalaya. Different surveys were conducted in the year 2019-20 to access the extensive use of *Gentiana kurroo* from the Khrew hills of Kashmir valley. The present research work was carried out to collect and gather local knowledge from tribal and nomadic people about traditional medicinal use of *Gentiana kurroo*. Indigenous knowledge was collected by interviewing people of different age groups in different regions of the Kashmir valley. An appropriate strategy and action plan for the conservation and sustainable utilization of this marvellous medicinal plant of the region need to be formulated and implemented effectively on the ground level which is lacking in Kashmir Himalayas.

Gentiana kurroo Royle (Gentianaceae) is an important and native medicinal plant of North-Western Himalayas. The genus *Gentiana* contains about 360 species^{3,14}, of which 62 species are observed in India¹⁵. It is commonly known as Indian Gentian, while in Kashmir Himalaya it is called as Nilkanth. *Gentiana kurroo* Royle a member of this family is a critically endangered medicinal herb of the western and northwestern Himalayan biomes. Although not mentioned by Sanskrit writers in *Materia Medica*⁵, it is a significant drug of Ayurveda¹². Vernacularly it is known as *Karu* in Hindi, *Traayamaana* in Sanskrit and Himalayan gentian or Indian gentian in English^{7,9}. *Gentiana kurroo* is a rosette-forming perennial herb, growing along sub-alpine North-Western Himalayas at an altitude of 1500-3000 meters above mean sea level. In Kashmir Himalaya it is usually found on south-facing steeper slopes along dry and rocky sloppy grasslands and sparsely shrubby scrubs. The roots of the plant are source of iridoid glycosides- Gentiopicroside, Gentiamarin and the alkaloid Gentianin. The roots of the plant are used as bitter tonic, antiperiodic, expectorant, astringent, stomachic, anthelmintic, antipsychotic, anti-inflammatory, sedative and antibacterial¹¹. It is also used for curing skin diseases, bronchial asthma and urinary infections². In trade it is often substituted for true gentian obtained from *Gentiana lutea*, a native of Europe and Asia Minor⁴. Because of its high medicinal value, the plant species has been over exploited from its natural habitat and no efforts are underway for replenishment and skilled harvesting. Efforts towards domestication have not been successful so far due to poor seedling establishment². The herb is also used for

curing the skin disease leucoderma, bronchial asthma, and urinary infections⁸. More than 80% of the population decline of the species has taken place in India in a time period of ten years. Therefore, the species is assessed as critically endangered. India has the majority of the geographical range (80%) and therefore, situation in India is considered as the representative of the global population of the species. Keeping in view the significance of this marvellous medicinal plant of Kashmir Himalaya, the present study was undertaken in nine different sites in Kashmir Himalaya to access the various aspects of studies of *Gentiana kurroo*, a critically endangered medicinal plant species of Kashmir Himalaya.

Study area: Khrew :

It lies in the Pulwama district of Kashmir valley. Khrew town of Pulwama is famous for its cement factories located there. It is located 34.02°N 74.98° E at an elevation of about 1607 meters 527 ft (Fig. I). Saffron cultivation is also famous in Khrew tehsil. JK cement factory is the first cement factory established in the Khrew and also four other cement factories were also established in the same area. Khrew is enclosed by various hills on its north and east sides. These are the main sites used for the limestone extraction for the production of cement there. The vegetation is very less in the outskirts of the Khrew town because the outskirt hills are continuously used and exploited for the limestone extraction for the production of cement for the entire Kashmir region. In the upper hills of Khrew pine trees and some shrubs are also present with little herbaceous plants and shrubs. Some



Fig I



Site I



Site II

important medicinal plants of this region are *Plantago lanceolata* L., *Artemesia vestita* Wall ex Besser, *Isodon rugosus* (Wall ex Benth.) Godd. *Artemesia absinthium* L., *Thymus linearis* Benth. *Marrubium vulgare*

L. and the most dominant critically endangered plant *Gentiana kurroo* (*Nilkanth*) is growing in the upper hills of the Khrew region.

Ecological and ethno-medicinal studies of Gentiana kurroo:

The present research was carried out

in 2019 and 2020 in Khrew area of Pulwama Kashmir Himalaya. This place was chosen for the present study in order to assess the various aspects of ecological studies of *Gentiana kurroo*, a critically endangered medicinal plant species of Kashmir Himalaya. Field surveys were conducted in various localities in the study area in 2019-2020 and a questionnaire was prepared to collect the information of medicinal use of the *Gentiana kurroo* by the local people of the region. The vegetation analysis of the *Gentiana kurroo* was carried out in the study area followed by the random sampling technique involving random quadrants. Different quadrants (n=36) of 1m² size (Misra, 1968) were laid down in Khrew hills particularly near the vicinity and behind the hills of Trumboo Cement industries (study site I) and also at a distance of 1 km from the cement industries where abundant vegetation of *Gentiana kurroo* was found in the adjacent hills of Khrew (study site II). The geographical coordinates of these sites are 34° 0' 5.7" N 75° 00' 56" E and the altitude of these sites are 1748 m above mean sea level.

Ecological studies :

The evaluation of floristic survey of *Gentiana kurroo*, a critically endangered medicinal plant in western Himalayas across selected sites in khrew forests was held in the year 2019-2020. At the first selected site behind the hills near the TCI cement factory, 32 plants of *Gentiana kurroo* were found. Most of the *Gentiana kurroo* plants were found on the barren surfaces of the hills. A large cement dust was found the aerial parts of the plant at this site. None of the fully mature was found in this study site. At this site the critical endangered *Gentiana kurroo* occupy

mostly gentle slopes and dry shady slopes habitats under the surfaces of big rocks. At the second selected site at a distance of 1 km from the cement industries where abundant vegetation of *Gentiana kurroo* (39 plants) was found in the adjacent hills of Khrew. Most of the *Gentiana kurroo* plants were found on the flat table land above tree surfaces habitats on the khrew hills at this site. None of the fully mature was found in this study site. At this site the critical endangered *Gentiana kurroo* occupy mostly gentle slopes and dry shady slopes under the surfaces of big rocks.

Ethno-medicinal studies of Gentiana kurroo:

During our survey it was found that the local people of khrew hills use roots of *G. kurroo* for the treatment of stomach-ache and also for against the urinary infections, the root with ginger root powder is also used for curing high fevers. The roots were also used as bitter tonic, and as an antiperiodic, expectorant, astringent, anti-inflammatory, antipsychotic, sedative, anthelmintic and antibacterial. Gentianine (alkaloid) in *Gentiana kurroo* possesses anti-inflammatory, analgesic, anticonvulsant, hypotensive, antipsychotic, sedative, diuretic, antimalarial, anti-amoebic and antibacterial properties and Amaraswerin acts as gastro-protective, whereas some traditional doctors use the whole plant against cough, fever, headache, liver ailments and as a blood purifier. The drug obtained from *G. kurroo* is very helpful in removing all kinds of weakness and overtiredness of body from prolonged illness, recovers digestive system and lack of appetite. The floral and vegetation studies of Kashmir Himalaya have been carried out since first half of the twentieth century⁸. But, here it is pertinent to mention that

no study has been carried out till date to document and study the ethno-medicinally important plant species in the target area. Hence, our study is of great significance as it provides a lead in documenting the knowledge of traditional herbal medicine Inherited from our forefathers. It is felt that there is a need for the rapid documentation of the valuable indigenous knowledge in the face of the emerging threats of destructive overharvesting, habitat degradation and bio-piracy^{6,10,13}. About 70 % of the identified medicinal plants of Indian Himalaya (PVP, 2001) are threatened by destructive harvesting. Tomar *et al.*,¹⁶ and Behara *et al.*,¹ carried out successive studies on *Gentiana kurroo* in Himachal hills but not as significant study is conducted on *Gentiana kurroo* in Kashmir hills.

The present study suggests that the traditional system of primary healthcare utilizes the plant resources as medicines in the studied area Khrew, India. Considering the ecological importance and population status of *Gentiana kurroo* in the study area, this plant species is becoming limited day by day. In old times the *Gentiana kurroo* medicinal plants were vigorously found in Dachigam National Park, Sonamarg hills and also in the studied area in Kashmir but nowadays only some individuals of this medicinal plant were present in Kashmir hills and is becoming critically endangered. The traditional knowledge system in the targeted area is known to few identified persons in the community and this knowledge generally inherited through the oral transfer in family lineages as there is no written document. Hence, our study is of great significance as it provides a lead in documenting the knowledge of traditional herbal medicine of the targeted

area. Due to over exploitation, alien plant invasion and habitat fragmentation many plant species are threatened in Kashmir hills. These ethno-medicinally important plants are un-paralled treasure of wealth hence a great boon for the humanity. Hence, documentation and conservation of such plant species should be done by the concerned authorities. It should be realized that conservation and management of potential species are of utmost importance.

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