

<https://doi.org/10.33472/AFJBS.6.8.2024.1969-1977>



African Journal of Biological Sciences



Habenaria intermedia D.Don (Riddhi)–History and Important Medicinal Properties

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Article History

Volume 6, Issue 8, 2024

Received: 26 Apr 2024

Accepted : 10 May 2024

doi: 10.33472/AFJBS.6.8.2024.1969–1977

ABSTRACT

In ancient days, different kinds of medicinal plants were used as medicine for various diseases. But nowadays the availability and awareness of herbal plants are very low. Especially the Ayurvedic plants like *Habenaria intermedia* etc. The conservation of medicinal plants is very much required for the enhancement of their population. Increasing the population of endangered medicinal plants will be useful in medical fields. But for preservation, the most effective methods and the proper knowledge about those plants are important. In medicinal plants, most of them have antioxidant properties. Mostly in the Himalayan regions, half of the herbal plants are available but low in number, using conservation techniques like plant tissue culture, will enhance the population of those plant species. But the survival rate of those plants is still a question mark for all. The status and strategies of medicinal plants have been recorded to increase awareness and the importance of those plants. But the availability of that information and development can be a challenge nowadays.

Keywords– Origin, importance, conservation ideas, plant tissue culture

INTRODUCTION

In our world, Chinese, Tibetan, European, and Indian systems have been using medicinally important orchids to prevent and cure different types of diseases. Orchids were first identified between 370–285 B.C. during the necessity of medicinal herbs. Orchids have been found to be very useful in ayurvedic treatment. In orchids an important genus is *Habenaria* which is called Riddhi. Out of different plants of genus *Habenaria intermedia* has been used extensively in Ayurveda.. Tuberos roots of Riddhi are used as a tonic, blood purifier, rejuvenator, and life span promoter⁸. The tuber of Riddhi has the antioxidant compound (Habenariol). This herb is also used in a situation of burning sensation, high fever, asthma, and skin diseases. Various kinds of diseases are cured by these kinds of medicinal herbs¹⁰. The roots of this herb are used for ayurvedic preparation to possess some antioxidant properties which are involved in the prevention of activity like anti–stress/adaptogenic

activity. Various numbers of medicinal properties are recorded in the *Habenaria* genus, and it is very helpful in the preparation of herbal syrup and medicines [14, 30, 31, 32, 33]. However, Riddhi is a very rare and endangered plant due to destruction of its natural habitat, wild extraction and environment that it needed to grow. The current populations of riddhi are discouraging. Further there is no definite agrotechnology have been developed or reported especially for this plant. Therefore there is an urgent need for its conservation and reintroduction into natural habitat to maintain the biodiversity and its availability for medicinal and therapeutic purposes which are required for healthy and active life. Increased interest of global population for herbal medicines and naturopathy has resulted in the huge demand of these herbs in the market. The natural populations are diminishing and available in limited numbers even in the Himalayan regions. Low availability of water and unsustainable harvesting are the further threats for the natural propagation of this plant. Therefore, creating awareness about the significance of these medicinal plants among the people is very necessary for their conservation. Apart from that proper cultivation procedures and agrotechnological developments are required to increase the harvesting and planting of herbs. *Habenaria intermedia* have many medicinal properties, but their natural population potential is very low.

New and strict strategies are required for conserving these plants but that is not taking place due to a lack of awareness and demand for other types of medicines²³. In ancient times, the people only used the natural medicine, and that was proved by seeing the old scriptures in the Indian system and Chinese systems. Natural medicines are from god so the responsibility of conserving and planting those herbal plants are in the people's hands. The present study has been focused on compilation of various aspects related to habit, habitat, morphology and phytochemistry and conservation of this very special plant *Habenaria intermedia* (D.Don.)

ORIGIN AND IMPORTANCE OF PLANT

Orchidaceae family is the biggest among flowering plant. and the recent survey accounts for around 17,000 to 35,000.. In the Orchidaceae family, *Habenaria intermedia* D.Don is one of the important plants, which is called Riddhi in Sanskrit. This plant is found at an altitude of 2000–3300m asl, especially in the places like Pakistan, Bhutan, and Nepal. But in India around 1500–2400 m from Kashmir to Sikkim, Himachal Pradesh, and Uttarakhand [3]. *Habenaria intermedia* D.Don is an important herb reported as component of Ashtvarga, Madhura varga, and Kokilo group. Its usefulness in treating conditions like asthma, skin diseases, gout, etc. has also been reported, Tubers, roots and leaves are the main parts of this plant having important bioactive compounds and antioxidant ¹⁰.

HABITAT AND DISTRIBUTION

Habenaria intermedia D.Don is available only in the Himalayan regions This plant flowers in July to August months²³. In the Himalayas, the temperature condition of the moist forest and some mixed forests of *Rhododendron arboretum* and *Myrica esculenta* species are mostly in open exposed grassland areas. The wide distribution of Vrddhi in the places like Arunachal Pradesh, Nepal, and Tibet¹⁰. By looking at some survey reports of the number of habitats in the particular plants in the family of Orchidaceae confirms which are native to India or which are non-native but *Habenaria intermedia* D.Don contains 6 habitats¹¹ and is distributed in Himalayan regions.

PLANT MORPHOLOGY

Habenaria intermedia D. Don is also called Vrddhi. It is undivided and growing in an upward, direction with a single stem. The stem is 25–50 cm long, slightly tapering or cylindrical, acuminate, and 5–7 nerved. The Flower color is white or greenish–white. Sepal is 20–25 cm high, ovoid shape. The Inner membrane is white in color, 5–7 nerved. Petals are white in color, and strongly–five nerved. Lip three–lobed, longer, longer white claws, mid lobe linear 3–5 cm long¹⁰. The microscopic view of plant parts gives a better understanding. The tubers are circular in transverse section view with few cork layers replaced as epidermis in tubers. It also contains unicellular to single–layer multicellular epidermal hairs and parenchymatous cortex cells are rich in starch grains. The starch grains differ from 8.78×8.79 to 14.03×20.13 μm and with the grain size of an average size of $12.03 \pm 3.28 \times 12.93 \pm 3.81$ μm . The average length of Raphids is 68.72 ± 21.85 μm and it varied between 33.12 to 98.09 μm ¹⁸. The Roots of *Habenaria intermedia* used in Chyvanparash and Ashtawarga formulations. Tuberous roots are used in the preparation of tonic⁸. Leaves and roots have been used for the most medicinal purposes, especially blood–related diseases²⁴.

MEDICINAL AND PHARMACOLOGY PROPERTIES

In the science of life, the treatment combines include products that are derived from plants, animals, minerals, etc. Among them, plant–based preparations play a major and significant role in the healing process. Healing with medicinal plants is as old as mankind itself. We have been using medicinal plants for an extremely long time,²⁶

Riddhi is an important member of the Ashtavarga group of plants. This plant is used in many herbal medicines for its health–promoting properties. This formulation contains the tubers of this herb, Riddhi, which possesses properties like being full of energy, immunity boosting, and high antioxidants²⁷. This herb is mostly used to treat sexual disorders, and physical weakness, strengthen the immune system, relieve body pains, and is used as a tonic. (Table .1)

Riddhi herb provides strength and vitality to the body and tranquilizes all three vitiated doshas, Guru Guna, and Madhura rasa (sweet taste). This herb is favorable to treat unconsciousness and diseases related to the vitiation of rakta and pitta dosha. Vrddhi placates the pitta dosha in the body. It is beneficial in providing strength to the uterus when having a baby, treats the condition of cough and frailty, and provides physical strength to the person.

Table 1. Medicinal properties of Habenaria plants and their pharmacological uses:

Name of the Species	Section used for medicines	Uses in Ethno–Botany	Medicinal properties
<i>Habenaria intermedia</i>	Leaves and tubers	Young leaves, tubers are used as vegetables and making of 'Chyavanprash'	Mostly used in asthma, fever, cold, and burning infection ⁴
<i>Habenaria edgeworthii</i>	Leaves and tubers	Making of 'Chyavanprash'– Ayurvedic tonic.	Mostly used in skin diseases, gout, asthma, fever, cold and burning infection ⁴

Ashtavarga Kashaya: It is used in the treatment of Vata diseases like joint diseases, bloating, arthritis, fever, joint pain, etc.

Chyavanaprasha: It is the effective management of respiratory diseases, improves the immunity system of the body, pain in the joints, improves the complexion of skin, is beneficial in hair growth, improves the appetite¹⁵.

There are other Ashtavarga plants like *Malaxis acuminata*, *Polygonatum cirrhifolium*, *Polygonatum verticillatum*, *Malaxis muscifer*. (Dhyani, A, Nautiyal, B.P. Nautiyal, M.C. 2010) have their own medicinal properties (Table. 2)

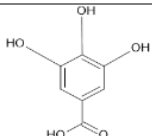
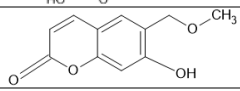
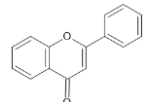
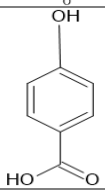
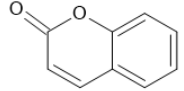
Table 2. Some other Ashtavarga Plants and their medicinal properties:

Name of the plants	Parts used	Uses in Ethno- Botany	Medicinal Properties
<i>Polygonatum Cirrhifolium</i>	Leaves and Tubers	Tubers and powders used to take with milk.	Used in increasing flow of mother's milk, fever and cold ⁶
<i>Polygonatum verticillatum</i>	Leaves and tubers	Powder with milk	Used in nocturnal emission and strangury ⁶ .
<i>Malaxis muscifer</i>	Stem (between leaf nodes)	Powder of plant take with hot water.	Used as tonic ⁶
<i>Malaxis acuminata</i>	Parts of stem (Pseudobulb)	Dried powder mix and taken with milk	Enhance reproductive tissue and sperm ⁶ .

BIOACTIVE COMPOUNDS AND THEIR USES

Habenaria intermedium was identified as the best source of phenols, tannins, and thiamine. The proper examination and research are done on the tubers of this plant. That shows the presence of more hydroxybenzoic acid content compared to other species of medicinal plants. The availability of more phenolic compounds in the *Habenaria intermedia* gives hope to the presence of antioxidants like gallic acid, scopoletin, and catechin. Antioxidants for chronic stress control, which also prevent many activities for different types of diseases and disorders²⁰. Medicinal plants always act against toxic compounds and give remedies for specific dangerous chemicals. Mainly in the *Habenaria intermedium* roots, shoots, and tubers are shown many bioactive compounds like tannins, terpenoids, steroids, flavonoids, carbohydrates, and amino acids²¹.

Table 3. Major bioactive compounds in *Habenaria intermedia* D.Don.

Compound name	Structure	Pharmaceutical roles
Gallic acid		Antioxidant in food, Antifungal, Antiviral, Anticancer ¹
Scopoletin		Antibacterial, Antifungal, Antioxidant, Antidiabetic ¹²
Flavonoids		Anti-inflammatory activities, Anticancer, stroke prevention, Neuropathy inhibition ²⁹ .
Hydroxybenzoic acid		Antifungal, Antibacterial, Antialgal, Antimutagenic, Estrogenic activities ⁵ .
Coumarin		Anti-Alzheimer, Antiviral, Antibacterial, Antidiabetic ²⁸

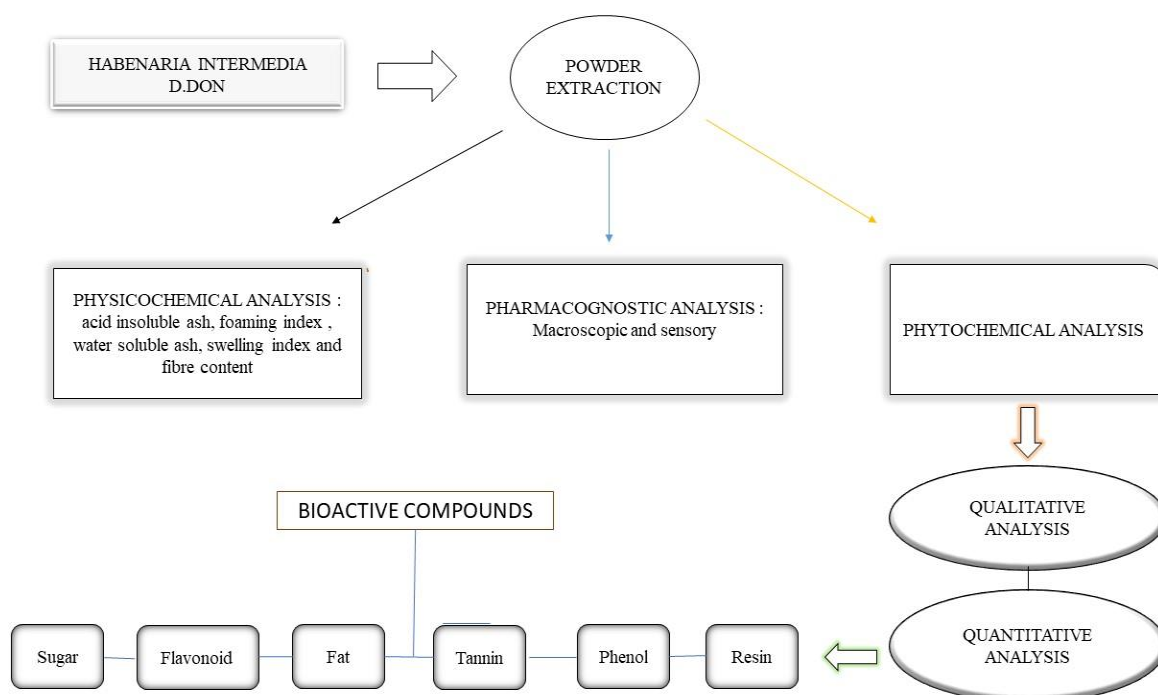


Figure 1. Evaluation of bioactive compounds in *Hebenaria intermedia*¹⁹

WHY IS IT ENDANGERED?

Hebenaria intermedia are endangered; the cultivation of this orchid species is required. This species is not regenerating and it is difficult to cultivate because they are present in opposite regions, so collecting and preserving is very difficult. The availability of these species is getting low due to their natural habitat⁴. During propagation, germination is very poor. Still, now there are no proper methods to preserve or conserve these plants. These kinds of situations still have not changed and are not taking any steps to conserve those species⁹. *Hebenaria intermedia* cultivation and the population of that species over the world is less. Natural gardens, nurseries, and land fields are the best place to preserve endangered species because of extinction of forest reservoir. Ex situ conservation is very useful in conservation of medicinal plants but without proper awareness and conservation plans, medicinal plants became exhaust. Due to this reason, availability of herbal medicines on normal days has reduced and people become vulnerable⁷.

CONSERVATION STRATEGIES

The need for conserving medicinal plants is taking place using some conservation strategies like in-situ, ex-situ, propagation methods, plant tissue culture techniques, etc. Researchers from the field of plants must take this as a serious issue and research it. By enhancing the population by using the different modes of preservation methods and some common methods like planting which increase the natural population of medicinal plants²². Different types of medicinal plants population are increased and conserved by using plant tissue culture techniques. The Plant propagation method also enhances the endangered species of plants, and it is mainly used for the development of rare species. Indian government is taking this as an important issue, and various ministries, organization, institution, (figure 2) and banking sectors are used in conserving herbal medicinal plants. These organization works on the development of medicinal plants on every state with different ideas²⁵.

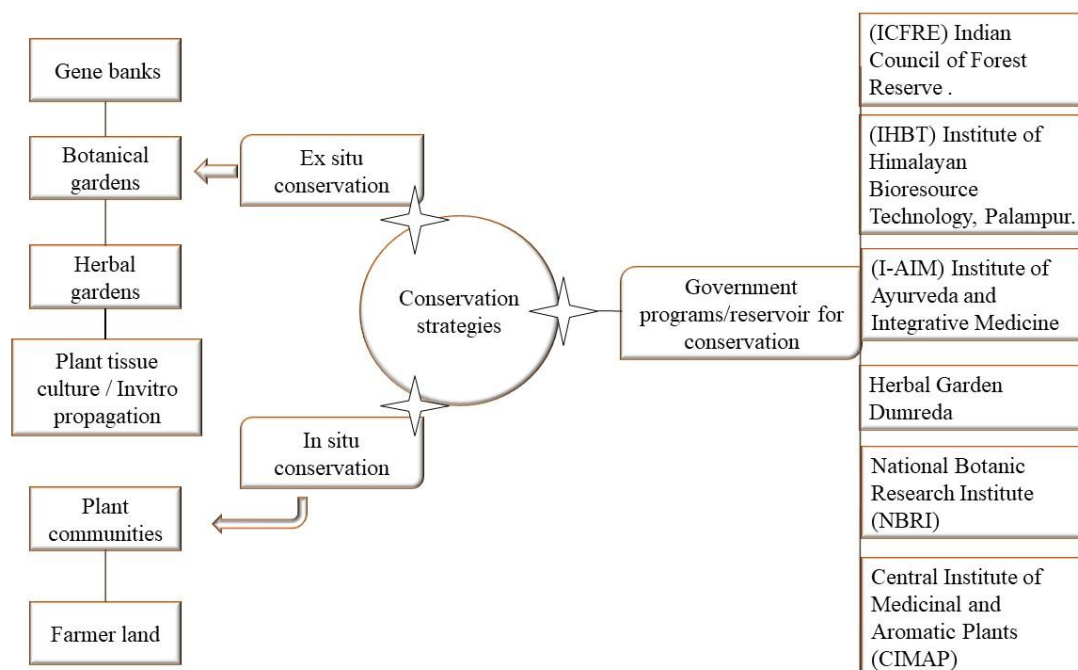


Figure 2. Conservation strategies of medicinal plants

Plant Tissue Culture of *Habenaria intermedia*

Habenaria intermedia, part of the Orchidaceae family, is on the verge of extinction. Plant tissue cultivation has turned out to be one of the emerging techniques in modern biotechnology. This method plays an important role in the mass propagation and artificial development of threatened and endangered species of the Orchidaceae family. In vitro propagation has helped grow clones of species such as from seeds or explants (shoots, stems, etc).

According to some studies, symbiotic seed germination in vitro culture allows orchids to reproduce without the need for fungi. This method was pioneered by Knudson, who in 1916 found this method to propagate orchid seeds while working on the effects of carbohydrates in green plants²².

The spread of plants without adequate nutrition cannot determine the success of plant tissue culture. Knudson C media, MS media (Murashige and Skoog), and Vacin and Went media are common media used for this culture¹³. Media is a complex solution of 20 or more macro- and micronutrients in three salts. Cytokinin and auxin, which regulate plant growth, are introduced into the environments for better growth. Various additives such as coconut water, banana pulp, peptone, tomato juice, ointment, honey, and cow's milk are also added to increase the propagation rate²². The use of large-scale production of endangered orchids through Plant Tissue Culture has had a beneficial effect on orchid growers for the past five decades. Different protocols are used to propagate endangered orchid species employing in vitro culture, stem cells, nodes, etc. Plant tissue culture can work as an alternative method to minimize the pressure on the natural population of orchids and for their sustainable use. Mainly after proper ex situ survey, the *Habenaria intermedia* plant is cultivated in the media like soil, sand, different nursery sand and wood chips⁷. Information about the conservation of this plant using plant tissue culture technique is not that much clearly reported. Because the availability of *Habenaria intermedia* became limited and people stated as one of the most endangered plants around the world.

Conclusion

According to some surveys, medicinal plants are conserved in places like nurseries, herbal gardens, research institutions, and farmer lands. Even these places have limited sources of endangered plants.

New programs, conservation ideas, plans are needed for cultivation of endangered species. Nowadays, there is no stable method to increase the population of medicinal plants. Some people are working on ex-situ mode of conservation, but the result is not appreciated. Other ways like in-situ mode of conservation followed, but here sources and environment conditions became poor. Proper conservation strategies are important, and the government sector started their research on endangered species. Information, awareness, and support of people must be there to develop stable methods to conserve endangered medicinal plants. Everyone must be aware of important Ayurvedic plants for natural products. In future, every reservoir will possess proper conservation methods and medicinal plants in more numbers. With the help of those plants, people will do more research on their medicinal uses.

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