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Review Article

Habenaria Species and Its Ethnomedicinal Importance: An overview

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ABSTRACT

Orchidaceae family to which the orchids belong is the second largest flowering plant family having around 850 genera. The members of this family includes mainly terrestrial orchid which are used for various beneficial effects in traditional medicine. Although detailed pharmacological studies on medicinal orchids are not available, however, reports have suggested that medicinal orchids possess wide usage by the local community for treating various ailments. *Habenaria Willd.* is an important genus in this family that largely contains terrestrial plants. Most of the reports for the medicinal usage of Habenaria species are from two large Asian countries India and China and they are generally used for treating kidney disorders, sexual dysfunction, spermatorrhoea, menstrual disorders, haematuria, hernia, tinnitus, nervousness and backache. In Ayurveda also the different species of Habenaria are used for revitalization or as aphrodisiac and are given a common name "Riddhi". This review article aims to introduce different species of Habenaria genus which are known for their medicinal value and thus can be considered for more effective propagation and conservation actions.

***Keywords*:** Orchids; Habenaria; Traditional medicine; "Riddhi"; Medicinal plants.

Introduction

Orchidaceae is the most evolved and the largest flowering plants family which is comprised of around 750-850 genera and contains 25,000 to 35,000 species.[1,2] The members of this family exist throughout the world except hot deserts and icy cold Antarctica. However the greatest diversity of these plants occurs in sub-tropical and tropical regions. The exquisite beauty of the complex flowers undoubtedly makes orchids ornamental elite. Orchids are also becoming an object of business worth million dollars nowadays. A rise in the rate of 10–20% of world floriculture trade was observed with increasing popularity of orchids as both potted floriculture crop as well as cut flowers.[3] Many orchids are also emerging to possess medicinal importance in addition to their ornamental value however their role is often overlooked as herbal medicine. Orchids have historically been used for their medicinal properties and possess various therapeutic applications as apparent from the published literature, but the information is although scanty and usually corresponds to a particular community or region.

An important genus in this family is *Habenaria Willd.* which largely contains terrestrial plants.[4] This genus is the largest among the subfamily Orchidoideae and currently known to contain around 835 species throughout the world (WCSP 2018). The pantropical distribution of Habenaria was observed with almost equal number of species found in continents of Asia, Africa and America.[5] There is only one comprehensive taxonomic study of this genus attempted by Kraenzlin (1901)[6] because of its wide distribution and large size where 347 species were recognized.

However, many taxonomic problems are present in defining this genus which further warrants the need for conducting critical studies particularly to identify the relationship amongst its species and its generic delimitation. A large number of Habenaria species (170 species are found in Brazil.[5,7]

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The genus also shows wide distribution throughout India with known 60–90 species which include 35–40 endemic species. They are mainly enriched in Western Ghats, with 50 species including 25–30 endemic ones.[8]

The Habenaria plants appear short with a subterranean tuber and whorl of leaves. They have terminal inflorescence containing multiple flowers distinguished by large, conspicuous, multilobed and flat lip. Monochromatic flowers generally appear white or green however they are brilliant pink, orange or yellow in some species. Distinct dry and wet seasons are required for the growth of Habenaria. The dormant phase is required for proper flowering or just survival. It needs a dormant phase to flower properly, or even just to survive.[9,10] The derivation of generic name is from Latin habena (strap, whip, veins, bridle) describing the presence of lip fringe of thread shapein some species. The petal shape and the lip form are the basis of classification of this genus member. In this review article we described some important Habenaria species and their medicinal values.

Overview

Around 54 Habenaria species have been identified in India and China together of which around 13 were found to have importance in Indian and Chinese medicinal systems.[11-13] Although the medicinal usage of orchids belonging to this genus in these two large Asian countries is not overlapping but there are certain exceptions like *H. arietina* (syn. *H. intermedia*) with known health improving effects in both the countries. *H. arietina* is used in both countries as a tonic in for treating people with weak intelligence quotient (IQ). The practitioners of Unnani and Siddha medicinal systems in India use Habenaria species as component of tonics used for treating consciousness lapses and uses as blood purifiers .[14] Chinese sources report several Habenaria species for common usage like replenishing "kidney yin", treating sexual dysfunction, spermatorrhoea, menstrual disorders, haematuria, hernia, tinnitus, nervousness and backache as shown in Figure 1.[12,13]

H. dentata is used by Taiwanese and Thai herbalists for treating infected wounds.[15,16] The genus Habenaria is among the few orchids which were mentioned in herbal texts of ancient India and were given Sanskrit names "Riddhi and Vriddhi".[14,17] Habenaria species are considered in India to be tonics of Vriddhi and Siddhi used as a blood purifier, de-worming tonic and for treating fainting spells.[18] An

aphrodisiac is also produced from *H. arietina* (syn. *H. intermedia*)[19] In Ayurveda, the different species of Habenaria like *H. arietina, H. ovalifolia, H. rariflora, H. acuminata, H. edgeworthii, H. roxburghii* and others are used for similar purpose of revitalization or aphrodisiac and are given a common name Riddhi.[14,17]

In addition to this, some Habenaria species are known at different places for different uses. For example, for treating scorpion and snake bites *H. arietina* is used[20] and for treating leucoderma *H. longicorniculata* is used. Some species of Habenaria are also used as food like in Surguja district, Chattisgarh, India, the tubers of *H. marginata* and *H. commelinifolia* are eaten after cooking as a vegetable.[21] In Java, the roots of *H. multipartia* and the tubers of *H. rumphii* are consumed as food.[22] The tubers of *H. malintana* which form the most showy and largest of this native Habenaria in Philippines are also reported to be edible.[23]

Some Habenaria species like H. intermedia were observed to contain high concentration of tannins, thiamins, total phenols, and calcium while some like *H. edgeworthii* are good sodium source. *H. intermedia* was also found to possess higher antioxidant potential as compared to other Habenaria species.[4] The phytochemicals enriched in *H. edgeworthii* is summarized in Table 1.[4]

Habenaria aitchisonii

The Habenaria species occurs mostly in grasslands, thickets and forests at height 2100-4300 m in temperate regions of Himalaya, Kashmir, Afganistan, Pakistan, Bhutan and some regions of China.[11,24] The medicinal herbs are usually collected from Tibet, Yunnan and Sichuan.[12] *Habenaria aitchisonii* is of medicinal importance in Chinese Herbal Medicine and is used to treat haematuria and nephritis. Its roots are known to possess beneficial effects on kidneys.[12,13]

Habenaria arietina (Habenaria intermedia)

The common name of this orchid is Reindeer Orchid, and it possesses beautiful and fragrant flowers. This species is usually distributed in temperate northeastern India (Himachal Pradesh, Uttar Pradesh, Ranikhet and Sikkim), Nepal, Bhutan, Bangladesh, Pakistan, northerm Thailand, Vietnam and southeastern China (Yunnan and Xizang) at 1500-2750 m height on grassy hill slopes.[11,25] H. arientana (H. intermedia) is also called Riddhi and is an important Ashtavarga ingredient of Chyawanprash which is used as a tonic for rejuvenation and blood purification.[26,27] In India H. arietina's rhizomes are used for producing aphrodisiac.[19] The roots as well as the leaves of H. intermedia are sweet in taste, has cooling effect and used to treat blood diseases.[28] Its tubers are proved to be beneficial against arthritis and crushed leaves are applied to cure snake bites.[28,29] The boiled tubers and cooked young leaves are eaten as vegetable in Nepal and are claimed to promote vitality.[30] Its tubers are also used as appetizer, rejuvenating, emollient and aphrodisiac tonic and used for treating thirst, fever, asthma, anoxeria, coughs and skin diseases. Reports have also claimed that its tubers confer intelligence.[31] The tubers were found protective against both chronic and acute psychological and physical stress.[32] The orchid was also found to possess immunostimulatory properties and improves delayed-type hypersensitivity response in mice as compared to standard cyclophosphamide. The phagocytic index was also improved in these animals in a dose dependent manner.[33]

Habenaria burchneroides

Habenaria burchneroides is also commonly known as bird's bill orchid. It is mainly found at exposed forest areas like paths in Taiwan and Hong Kong at about 800 m. In Traditional Chinese Medicine, *Habenaria burchneroides's* stem has been used for detoxification and improving weak kidneys. It is also used for treating urinary problems, impotence, hernia, gonorrhea, leucorrhoea, nocturnal emissions, stomachache, snake bite, tuberculosis and kidney infections.[13,16] The tincture of *Habenaria burchneroides* is also taken as a tonic in rice wine along with rice for improving internal injuries.[12]

Habenaria commelinifolia

Habenaria commelinifolia plant is abundant throughout India and is consumed as a vegetable.[14,34] The plant also occurs at 900 to 1200 m altitude in regions of Yunnan, Thailand, Nepal, Myanmar and Vietnam.[11] *Habenaria commelinifolia* has been known to be a blood purifier and used for curing palm blebs.[34] The orchid's roots in dried form are used for curing spermatorrhoea. In the preparation to be used equal quantities of Saraca indica (Ashoka tree) and H. commelinifolia's dried roots are boiled in 1L water and reduced the volume to 100ml. This concentrated decoction needs to be consumed for 10 days on empty stomach.[35] Saraca indica is also known for treating gynaecological conditions in India because of its oestrogenic effects (anti-androgenic) and thus can keep women healthy and youthful.[20,26,31,36,37]

Habenaria crinifera

The distribution of *H. crinifera* is in Sri Lanka and Western Ghats where it is commonly found on the roadside covering large areas.[10] This species is also distributed from Kerala to Maharastra. The plant tubers are generally used for treating headache by the tribal people inhabiting Kudremukh National Park, Karnataka.[18]

Table 1: Phytochemicals/minerals enriched in *H. edgeworthii* [4]

S.No.	Phytochemical/Mineral	Enrichment
1.	Alkaloids	0.47 ± 0.05 mg/g dry weight
2.	Tannins	2.24 ± 0.02 mg/g dry weight
3.	Phenols	5.31 ± 0.06 mg/g dry weight
4.	Flavonoids	3.05 ± 0.05 mg/g dry weight
5.	Thiamine	5.75 ± 0.06 mg/g dry weight
6.	Riboflavin	3.56 ± 0.3 mg/g dry weight
7.	Mineral ash	3.56 ± 0.3 mg/g dry weight
8.	Fiber	4.61 ± 0.1 mg/g dry weight
9.	Fat	6.27 ± 0.8 mg/g dry weight
10.	Sodium	62.90±0.01c mg/100 g dry weight
11.	Potassium	219.27 ± 0.04b mg/100 g dry weight
12.	Calcium	158.65 ± 0.07a mg/100 g dry weight
13.	Lithium	3.39 ± 0.01b mg/100 g dry weight
14.	Copper	4.76 ± 0.02a mg/100 g dry weight
15.	Zinc	4.51 ± 0.03b mg/100 g dry weight
16.	Iron	84.54 ± 0.02a mg/100 g dry weight
17.	Magnesium	6.69 ± 0.06b mg/100 g dry weight
18.	Cobalt	5.37 ± 0.12b mg/100 g dry weight

Location and ethno medicinal importance of genus Habenaria

In the following sections the location and ethno medicinal importance of different Habenaria species are described (summarized in Table 2).

Habenaria davidii

This is a Chinese endemic species which is generally found in grassland, forests and thickets at 600-3200 m altitude in Hunnan, Guizhou, Hubei, Yunnan, Sichuan and Tibet.[11] The herb is usually

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collected from Tibet and Yannan. Its roots are used to protect kidneys and reduce swelling in Chinese herbal medicine. *Habenaria davidii* can also reduce lymph nodes swellings and is used for treating hernia.[12,13]

Habenaria delavayi
This plant is commonly called as Jishenshen in Chinese Medicinal system and is an endemic plant in China.[38] The plant generally occurs in Tibet, Yunnan, Guizhou and Sichuan. It is commonly collected from these regions in autumn. The tubers of this plant are either dried or used fresh and have implications in treating waist pain, nephritis and renal insufficiency. It is recommended to add 15 to 30 g of Jishenshen in chicken soup by Chinese herbalist.[12,39] The plant has been reputed for body strengthening and is used as a tonic for reducing kidney weakness, dizziness, lumbago, hernia, neurosis and tinnitus.[13,40]

Habenaria dentata
H. dentata shows wide distribution which extends from Indian Himalayan regions at altitude 200 to 2300 m, Nepal, Myanmar, Thailand, Indonesia, Phillippines, Ryukyu Islands of Japan, Taiwan, Hong Kong, Guangdong, Guizhou, Yunnan and Philippines. This medicinal plant is generally collected in autumn. The plant has been known to benefit kidneys and lungs in Chinese medicinal system. They are anti-inflammatory,diuretic and possess detoxification potential. The stem of this plant is used for treating weak kidneys, swollen kidneys, stomach ache, dysuria, carbuncles, impotence and tuberculosis associated cough.[12,39] The roots pounded were used in Taiwan by aboriginal mountain tribal people for wound dressing and swelling. The tubers are also used by Thai herbalists for bodily discomfort and abscesses.

Table 2: Therapeutic effects of Habenaria species

S.No.	Species name	Location	Therapeutic effect	Reference
1.	***Habenaria aitchisonii***	Himalaya, Kashmir, Afganistan, Pakistan, Bhutan and China	Kidney disorders, haematuria and nephritis	12, 13
2.	***Habenaria arietina (Habenaria intermedia)***	India (Himachal Pradesh, Uttar Pradesh, Ranikhet and Sikkim), Nepal, Bhutan, Bangladesh, Pakistan, northerm Thailand, Vietnam and southeastern China	Thirst, fever, asthma, anoxeria, coughs and skin diseases, arthritis, snake bites, hypersenstivity	28, 29, 31, 33
3.	***Habenaria burchneroides***	Taiwan and Hong Kong	Urinary problems, impotence, hernia, gonorrhea, leucorrhoea, nocturnal emissions, stomach ache, snake bite, tuberculosis and kidney infections	13, 16
4.	***Habenaria commelinifolia***	India, Yunnan, Thailand, Nepal, Myanmar and Vietnam	Palm blebs, spermatorrhoea, gynaecological conditions	31, 35, 37
5.	***Habenaria crinifera***	Sri Lanka and Western Ghats, Kerala to Maharastra	Headache	18
6.	***Habenaria davidii***	Hunnan, Guizhou, Hubei, Yunnan, Sichuan and Tibet	Kidney disorders, lymph nodes, hernia	12, 13
7.	***Habenaria delavayi***	Tibet, Yunnan, Guizhou and Sichuan	Waist pain, nephritis and renal insufficiency	13
8.	***Habenaria dentata***	Indian Himalayan regions, Nepal, Myanmar, Thailand, Indonesia, Phillippines, Ryukyu Islands of Japan, Taiwan, Hong Kong, Guangdong, Guizhou, Yunnan and Philippines	Lung disorders, weak kidneys, swollen kidneys, stomach ache, dysuria, carbuncles, impotence, wound dressing and tuberculosis associated cough	13, 16

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9.	***Habenaria digitata***	India, western Himalayas, Bangladesh, Nepal, Cambodia, Pakistan and Myanmar	Analgesic and anti-inflammatory potential	41
10.	***Habenaria diphylla***	India, Nepal, Bangladesh, Myanmar, Thailand, Phillipines and Southern Yunnan	Asthma and insect bites	14
11.	***Habenaria diplonema***	Southwest Sichuan, northern Fujian and southwest Yunnan	Regulate menstruation and to improve liver and kidney functions	12
12.	***Habenaria disceras***	Yunnan, Guangxi and Guangdong	Treating indigestion especially in children	12
13.	***Habenaria furcifera (Habenaria ovalifolia)***	Western Peninsular India, Nepal, Sikkim, Bhutan, Pakistan, Thailand, Myanmar and China	Haemorrhage, blood fever disorders, snake bites, wounds and wasting diseases	17, 46
14.	***Habenaria hollandiana***	Assam, Eastern Ghats and Eastern Himalaya	Maggot-infected sores and scorpion stings	49
15.	***Habenaria limprichtii***	Vietnam, Yunnan, Sichun and western Hubei	Improving renal functions, treating nephritis and for "feminine nourishment"	12
16.	***Habenaria linguella***	Yunnan, Guangxi, Guangdong, Hong Kong and Vietnam	Clearing "heaty lungs"	12, 13
17.	***Habenaria longecalcarata (Habenaria longicorniculata)***	Bihar, Orissa, Tamil Nadu and Sri Lanka	Scrotal enlargement, swelling and pain	54, 55, 56
18.	***Habenaria marginata***	India, Pakistan, Nepal, Bhutan, Orrisa, Bangladesh, Thailand and Myanmar	Malignant ulcers	35, 49
19.	***Habenaria pectinata***	India, Yunnan, Bhutan, Pakistan and Nepal	Arthritis, snake bites, nephritis, pain and weakness	28, 58
20.	***Habenaria petelotii***	Vietnam and China's southern provinces (Fujiah, Anhui, Guangdong, Zhejiang, Hunan, Jiangxi, Yunnan, Guangxi, Ghizhou)	External injuries, "heat lungs" associated coughs, erectile dysfunction, renal insufficiency and hernias	12
21.	***Habenaria plantaginea***	India, Bhutan, Sri Lanka, Myanmar, Bangladesh and Sunda Islands	Blood disorders, haemorrhage, fever, fainting, Diabetes and wasting diseases	59, 60
22.	***Habenaria rhodocheila***	Hainan to Guangdong northwards, Guizhou, Guangxi, Hongkong, Jiangxi, Fujian and in Southeastern Asia	'Heatiness', pain relief, swellings and traumatic injuries	13

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23.	***Habenaria roxburghii***	Peninsular India	Fever, snake bites, wasting diseases, blood disorders, fainting and haemorrhage	17, 46
24.	***Habenaria stenopetala***	Pakistan, Southeast Asia, Tibet, northern India, Taiwan, Guizhou and Ryukyu Islands (Japan)	Hernias and erectile dysfunction	13

Habenaria digitata
The orchid is also commonly known as Fingered Habenaria. It is found in India, western Himalayas, Bangladesh, Nepal, Cambodia, Pakistan and Myanmar at altitude of 500-1000 m.[8] The crude extract of *H.digitata* was found to possess analgesic and anti-inflammatory potential. It was found to inhibit lipooxygenase and cyclooxygenase enzymes with IC50 values of 32.39 µg/ml and 21.30 µg/ml respectively. The crude extract of *H.digitata* was also found to inhibit paw edema in carrageenan induced rodent inflammation models at 4th h.[41]

Habenaria diphylla
This species of Habenaria is commonly found on forest rocks, valleys and damp locations at altitude of 1000 to 1400 m. It is distributed in northern India, Nepal, Bangladesh, Myanmar, Thailand, Phillipines, Southern Yunnan and also at low elevations of southern India west coast.[11,42] In Thailand the whole plant is used to treat insect bites. In Western Ghats, H. diphylla's flowers are commonly called as Jeevahi Purusharatna and are used for treating asthma.[14]

Habenaria diplonema
It is an endemic plant in China occurring at altitude of 2800-4200 m on soil covered rocks in regions of southwest Sichuan, northern Fujian and southwest Yunnan. The medicinal plant is generally obtained from Yunnan. Its roots are used to regulate menstruation and to improve liver and kidney functions.[12]

Habenaria disceras
It is also an endemic plant in China occurring at altitude of 600 to 2200 m on forest soil covered rocks, damp locations and along valleys in regions of Yunnan, Guangxi and Guangdong. The medicinal plant is generally obtained from Yunnan and Guangxi.[11] The roots of this plant are used for treating indigestion especially in children.[12]

Habenaria furcifera (Habenaria ovalifolia)
Habenaria furcifera occurs besides streams on moist slopes in deciduous forests of western Peninsular India, Nepal, Sikkim, Bhutan, Pakistan, Thailand, Myanmar and China at altitude 1100 to 1200 m.[11,42] It flowering period is variable at different regions and usually lies between July to October.[43-45] The medicinal importance of this plant is also recognized in Ayurveda and the tubers of this plant are used for treating haemorrhage, blood fever disorders and wasting diseases.[17] Chenchus also used the paste of this orchid for snake bites, cuts and wounds in India.[46]

Habenaria hollandiana
H. hollandiana is endemic species in India which is usually distributed in Assam, Eastern Ghats and Eastern Himalaya. In Eastern Ghats the orchid is found near waterfalls in shady, cool locations.[47] The fresh paste of this plant is used for treating scorpion sting by Valmikis and Kondareddies of Andhra Pradesh.[48] In Bangladesh also the paste of tubers are used for treating maggot-infected sores and scorpion stings.[49]

Habenaria limprichtii
Habenaria limprichtii plant is found at altitude of 1500-2000 m in grassland and thickets of northern Thailand. It is also found in Vietnam, Yunnan, Sichun and western Hubei at altitude of 1900-3500 m.[50] This plant characteristically turns black on drying.[11] *Habenaria limprichtii* plant is known in China for "feminine nourishment". Plants are rich sources of oestrogenic compounds but reports have not shown the presence of phyto-oestrogens in *H. limprichtii.* This plant is also used for improving renal functions and treating nephritis.[12]

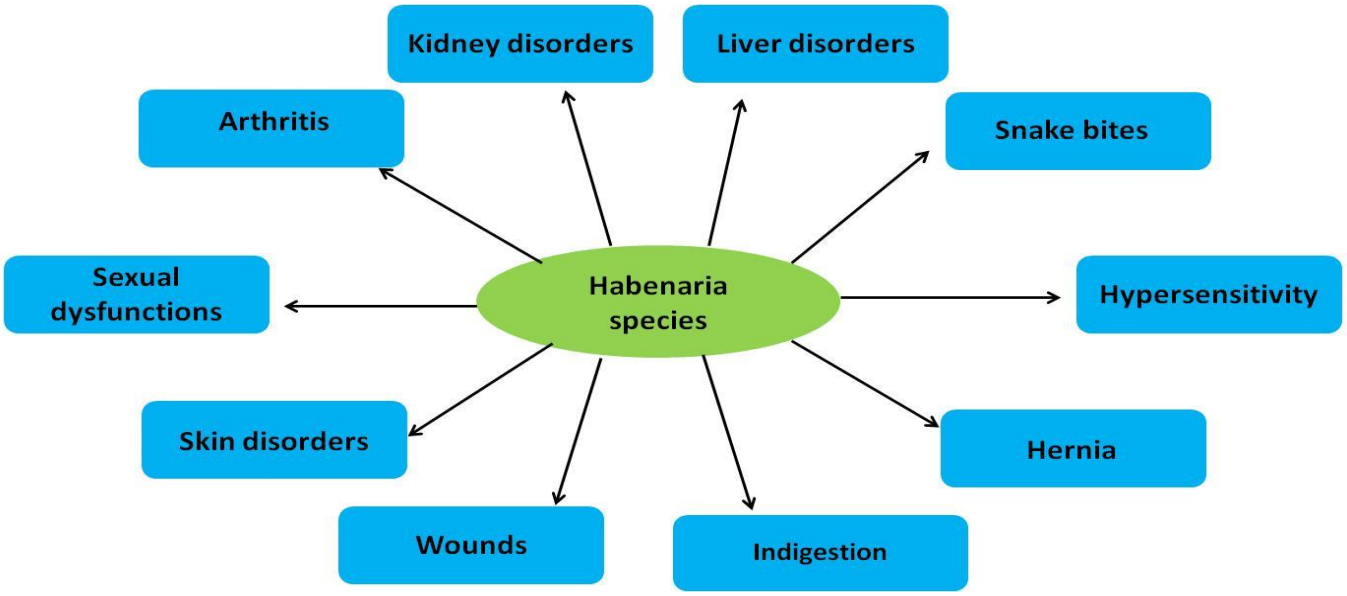

Figure 1: Therapeutic effects of genus Habenaria

Habenaria linguella
Habenaria linguella plant is found at altitude of 500-2500 m in the grasslands and forests of Yunnan, Guangxi, Guangdong, Hong Kong and Vietnam.[12] 9-15 gm of this orchid is used for making decoction and it is used for clearing "heaty lungs".[13]

Habenaria longecalcarata (Habenaria longicorniculata)
Habenaria longicorniculata is also known as Devasunda in India. It grows at an altitude of 800 to 4300 m,[51] extending from north-east to Bihar, Orissa and Sri Lanka.[52,53] This orchid can be seen growing gregariously on thin soil layer on rock located at exposed slopes at 1200-1400 m altitude in Tamil Nadu. Feeding on fresh tubers of *H. longicorniculata* were found helpful in reducing scrotal enlargement as reported by Natti Vaidyas (folk practitioners) in a Natti Vaidyas Sammelan held in August 1997 at Kolli Hills in Tamil Nadu.[54] All the different parts of this plant were found useful in reducing swelling and controlling pain.[55,56] The mixture of crushed tuber paste of this orchid with equal amount of turmeric powder can be applied to correct leucoderma at affected site.[35]

Habenaria marginata
The orchid is called as Humari in Bangladesh and India and also commonly called as Golden Yellow Habenaria. It is a terrestrial small herb which covers a large area and distributed from northern India, Pakistan, Nepal, Bhutan, Orrisa, Bangladesh, Thailand and Myanmar. It can be commonly seen at 500 to 2000m altitude in the paddy fields and also in sandy, open grasslands in central Bhutan (Tashigang District) at altitude 1680–1770 m.[42] The orchid is used for treating malignant ulcers in Niyamgiri Hills (Orissa, India) and Bangladesh. For it the tubers of the orchid (250g) are boiled in 1000ml water till 250ml of decoction remains and this decoction is to be drunk for 14 days after adding a teaspoon of honey.[35,49] The tubers are also eaten after cooking as vegetable by people inhabiting Madhya Pradesh.[21]

Habenaria pectinata
The orchid is also known as Safed musli in India. This species is found in the forests of temperate northeast India, Yunnan and Nepal.[11] The orchid inhabit the shady banks of temperate forests edges in Indian Himalayas at altitude of 2000 to 3000 m and forests of *Pinus wallichiana* or grassy open meadows in Bumthang, Bhuan at altitude of 1520 to 2900 m.[43,57] It also occurs at altitude of 800 to 1100 m in Pakistan.[25] The crushed leaves of *Habenaria pectinata* is used in India for treating snake bites. Its tubers on mixing with condiments are a herbal remedy for treating arthritis.[28] In China the whole plant is known for treating cough which arises from nephritis, pain and weakness at waist.[12,13] The anti-arthritic potential of this orchid is also reported. A study demonstrated that methanolic and Ethyl acetate extracts of *H. pectinata* tubers stabilize erythrocyte membranes and inhibited egg albumin and bovine serum denaturation similar to traditional anti-arthritic drugs. The presence of phytoconstituent piperine was found responsible for its anti-inflammatory activity.[58]

Habenaria petelotii
This species of Habenaria is found along valleys and in forests in Vietnam and China's southern provinces (Fujiah, Anhui, Guangdong, Zhejiang, Hunan, Jiangxi, Yunnan, Guangxi, Ghizhou).[11] In China *H. petelotii* is used for treating external injuries, "heat lungs" associated coughs, erectile dysfunction, renal insufficiency and hernia.[12] For making decoction 9 to15 g of the herb is used.[13]

Habenaria plantaginea
This Habenaria species is known as Kusuma gadda in Bangladeshi. The species is common and is found at altitude below 900 m all over India, between 1000-2500 m in Bhutan and Sri Lankan dry zone forests.[10,42] In plains it occurs at the thickets borders of scrub forests receiving direct sunlight.[53] The orchid is also found in Myanmar, Bangladesh and Sunda Islands. The tubers of this plant is used for treating blood disorders, haemorrhage, fever, fainting and wasting diseases.[17] In Andra Pradesh (Eastern Ghats), the paste is formed from the tubers of *H. plantaginea*, garlic and black pepper which is then formulated into tablets. These tablets are beneficial for relieving stomachache and chest pain.[59] The tubers are also used in Bangladesh for treating ache and chest pain.[49] The roots of this plant was also found to possess anti-diabetic potential.[60] A study had also demonstrated that *H. plantaginea*-fabricated nanoparticles are effective against wide range of mosquito vectors.[61]

Habenaria rhodocheila
This orchid species is widely found from Hainan to Guangdong northwards, Guizhou, Guangxi, Hongkong, Jiangxi, Fujian and in Southeastern Asia. It is generally found at an altitude of 300–1500 m at forest's soil covered rocks, along valleys and in shaded places in China.[11] It is also found under full sun along valleys on rocks in Malaysia, Penang and nearer to the equator at altitude of 1500 m. This orchid is used in China to be applied on finger to promote healing of ulcers.[12] The decoction is prepared using 3 to 9 g of this herb used for treating 'heatiness', pain relief, swellings and traumatic injuries.[13]

Habenaria roxburghii
This orchid is endemic to Peninsular India[10] and is commonly found along the coast of Coromandel.[52] It is generally found at altitude of 800 m in scrub jungle and the plains, on exposed rocks and often sheltered by thorny bushes.[53] In Tamil Nadu, the tubers of H. roxburghii are used by Ayurveda practitioners for treating fever, wasting diseases, blood disorders, fainting and haemorrhage.[17] The tubers around 10–15 g are crushed with pepper (2–3 g) and garlic, and this extract is eaten orally by Konda reddis tribe in Andhra Pradesh for curing snake bites.[46]

Habenaria stenopetala
H. stenopetala is commonly found dipterocarp forests open areas in Pakistan, Southeast Asia, Tibet, northern India, Taiwan, Guizhou and Ryukyu Islands (Japan) at altitude of 300–1800 m. This orchid is also called as Jishencao in Chinese herbal medicine and is used to treat hernias and erectile dysfunction. The medicine prepared after boiling dried plant (3-9g) is used to enhance sexual and kidney functions.[13]

Conclusion

Habenaria is an important genus which includes mostly terrestrial orchids and the members of this genus are more commonly used in India for the preparation of health tonics. In Chinese traditional medicinal system also various Habenaria species are used for curing anomalies like sexual dysfunctions, nervousness and kidney disorders (Figure 1). The previous reports have highlighted the therapeutic importance of these orchids which is mainly due to the presence of various phytochemicals but the studies available to prove this are very limited. Therefore, detailed studies are required to identify the active components responsible for medicinal importance of Habenaria species with accuracy through modern research activities which can further accelerate the drug discovery rate more precisely.

Conflict of Interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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