

Medicinal Orchids: An Overview

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Abstract

Orchids are the largest and most diverse group among the angiosperms. They are cultivated for beautiful flowers. They are widely known for their economic importance but less for their medicinal value. Some plants like *Dendrobium crumenative*, *Eulophia campestris*, *Orchis latifolia*, *Vanda roxburghii* and *Vanda tessellata* have been documented for their medicinal value. Phytochemically some orchids have been reported to contain alkaloids, triterpenoids, flavonoids and stilbenoids.

Ashtavarga (group of eight medicinal plants) is vital part of Ayurvedic formulations like Chyvanprasha and four plants viz, Riddhi, Vriddhi, Jivaka and Rishbhaka have been discussed as possible members of family Orchidaceae. Recently there has been tremendous progress in medicinal plants research; however orchids have not been exploited fully for their medicinal application. The article reviews medicinally important orchids along with recent pharmacological investigations.

Key words: Orchids, Orchidaceae, Medicinal Plants, Ayurveda.

Introduction to medicinal orchids

Orchidaceae is one of the largest families among angiosperms. According to one estimate the family includes 800 genera and 25,000 species. (1) Orchids are well known for their economic importance and widely cultivated for ornamental purposes. Orchids are cosmopolitan in distribution. *Vanilla planifolia* is commercially important orchid as it is source of vanillin used as a foodstuff flavoring. (2)

Historical aspects

The term orchid was coined by Theophrastus as anatomy of the plants resemble with testicles. Greek

word orchid literally means testicles. (1) This may account for use of orchids as aphrodisiacs in ancient civilizations. When we study the history of ancient Alternative systems of medicine Ayurveda and Traditional Chinese Medicine (TCM) are on the forefront. (3)

Asthavarga is important ingredient of various classical Ayurvedic formulations like Chavyanprasa. (4) Out of eight constituents of Ashtavarga, four have been reported to be orchids (see Table 1).

Table 1. It shows eight medicinal plants used in Ashtavarga, composite Ayurvedic formulation. The plants marked with stars have been reported to be orchids.

S.No.	Ayurvedic name	Botanical name	Family	Part used
1.	Jivaka*	<i>Malaxis muscifrea</i>	Orchidaceae	Bulb
2.	Rishbhaka*	<i>Malaxis acuminata</i>	Orchidaceae	Pseudo-bulb
3.	Meda	<i>Polygonum verticilliatum</i>	Polygonaceae	Rhizome
4.	Mahameda	<i>Polygonum cirrifolium</i>	Polygonaceae	Rhizome
5.	Kakoli	<i>Roscoea procera</i>	Zingiberaceae	Root
6.	Kshira Kakoli	<i>Fritillaria roylei</i>	Liliaceae	Root
7.	Riddhi*	<i>Habenaria intermedia</i>	Orchidaceae	Root
8.	Vriddhi*	<i>Habenaria edgeworthii</i>	Orchidaceae	Root

Traditional Chinese medicine widely utilizes orchids in medicines. A few of them have been subjected to phytochemical and pharmacological studies. (3) In India work has been carried out on chemical analysis of some medicinally useful orchids. *Eulophia campestris*, *Orchis latifolia*, *Vanda roxburgii*

are some important plants to mention. (5) *Dendrobium macraei* is another important orchid from Ayurvedic point of view as it is reported to be source of Jivanti. (6) *Cypripedium parviflora* is widely used as aphrodisiac and nervine tonic in Western Herbalism (1, 3).

Many medicinal orchids are reported to contain alkaloids. Antimicrobial activities of some orchids have been suggested although detailed investigations are still warranted. (7) Recent works have reported isolation of anthocyanins, stilbenoids and triterpenoids from orchids. Orchinol, hircinol, cypripedin, jibantine, nidemin and loroglossin are some important phytochemicals reported from orchids. Some of the phytochemicals isolated from orchids along with biological source have been tabulated below (SEE Table 2):

Table 2. Some phytochemicals isolated from orchid.

S.No	Name of phytochemical	Phytochemical class	Source
1.	Aeridin	Phenanthropyran	<i>Aerides crispum</i>
2.	Agrostophyllinol	Triterpenoid	<i>Agrostophyllum brevipes</i>
3.	Agrostophyllinone	Triterpenoid	<i>Agrostophyllum brevipes</i> and <i>Agrostophyllum callosum</i>
4.	Isoagrostophyllol	Triterpenoid	<i>Agrostophyllum callosum</i>
5.	Orchinol, 6-methoxycoelonin, imbricatin, flaccidin, oxoflaccidin, isooxoflaccidin, flaccidin, agrostophyllin, callosin, callosinin, callosumin, callosuminin and callosumidin.	Stilbenoids	<i>Agrostophyllum callosum</i>
6.	Arundinan	Stilbenoid	<i>Arundina graminifolia</i>

7.	Cypripedin	1-4 phenanthrenequinone	<i>Cypripedium calceolus pubescens</i>
8.	Loroglossin	Glucoside	<i>Orchis latifolia</i>
9.	Jebantine	Alkaloid	<i>Dendrobium macraei</i>
10.	Gigantol	Bibenzyl	<i>Dendrobium nobile</i>
11.	Moscatilin	Bibenzyl	<i>Dendrobium nobile</i>
12.	Dendrobine	Alkaloid	<i>Dendrobium nobile</i>
13.		Anthocyanins	<i>Dracula chimaera</i> (21)
14.	Nudol	Phenanthrene	<i>Eulophia nuda</i>
15.	Melianin	Glycoside	<i>Vanda roxburghii</i>
16.	Nidemin	Triterpenoid	<i>Nidema boothi</i> and <i>Scaphyglottis</i>
17.	Kinsenoside	Glycoside	<i>Anoectochilus formosanus</i>
18.	Rotundatin and moscatin	Phenanthrene	<i>Dendrobium moscatum</i>
19.	Gymopusin	Phenanthrene	<i>Bulbophyllum gymopus</i>

Materia Medica of Medicinally important orchids

***Aerides crispum* Lindl.**

Origin: India.

Phytochemistry: Phenanthropyran: aeridin. (8)

Part used: Tubers.

***Aerides multiflorum* Roxb.**

Syn: *Aerides affine* Lindl.

Distribution: Himalaya (Garhwal to Sikkim), Assam, India and Burma.

Part used: Tubers.

Pre-clinical studies: Antibacterial (16).

***Agrostophyllum brevipes* Ridley**

Distribution: E. Himalaya to Indo-China.

Phytochemistry: Triterpenoids: agrostophyllinol and agrostophyllinone. (9).

Part used: Tubers.

***Agrostophyllum callosum* Rchb. f**

Distribution: Himalaya (Nepal to Bhutan), Assam, Burma, Thailand, Malaysia. (10)

Botany: *Agrostophyllum callosum* is 30-60 or higher plant. Stalks are creeping rhizomes. Rhizome 3-4 mm and stem erect. Leaves 8-13 cm wide and inflorescence 1-2 cm in diameter with short pedicles. Flowers pink or white colored. (10)

Phytochemistry: Triterpenoids: agrostophyllinone and isoagrostophyllol, stilbenoids: orchinol, 6-methoxycoelonin, imbricatin, flaccidin, oxoflaccidin, isooxoflaccidin, flaccidin, agrostophyllin, callosin, callosinin, callosumin, callosuminin and callosumidin. (11, 17)

Part used: Tubers.

***Anoectochilus formosanus* Hayata**

Distribution: Taiwan. (3)

Botany: *Agrostophyllum callosum* is 30-60 or higher plant. Stalks are creeping rhizomes. Rhizome 3-4 mm and stem erect. Leaves 8-13 cm wide and inflorescence 1-2 cm in diameter with short pedicles. Flowers pink or white colored. (3)

Phytochemistry: Glycoside: kinsenoside (12) and polysaccharide (13).

Part used: Tubers.

Action: Anticancer.

Therapeutics: Hepatitis, hypertension and cancer. (3, 11)

Pre-clinical studies: Antioxidant (14, 15), antihyperglycemic (15), hepatoprotective: kinsenoside (12, 14) and immuno-modulating: polysaccharide (13)

***Arundina graminifolia* (D. Don) Hochr.**

Syn: *Arundina bambusifolia* Lindl., *Cymbidium bambusifolium* Roxb.

Common name: Bamboo Orchid.

Distribution: Himalayas of Nepal, Sri Lanka, Thailand, Laos, Cambodia, Vietnam, southern China, Japan, Taiwan and south to Malaya and Java. (3)

Botany: *Arundina graminifolia* is a large terrestrial plant with erect stems that are 1.5-2.5 cm tall and up to 1.5 cm in diameter. The leaves are borne in two ranks and are narrowly oblong and grass-like, 12-30 cm long and 1.6-2.5 cm. The simple, terminal inflorescence may be branched and is 15-30 cm long. The large cattleya-like flowers are purple-red, flesh-coloured or white and are up to 10 cm across. The lip is darker than the sepals and petals, often veined darker purple and has a yellow to orange-yellow patch at the base. The short-lived, scented flowers last for about 3 days and there are usually several open at a time. (18)

Phytochemistry: Benzyldihydrophenanthrene: arundinaol, stilbenoid: arundinan and phenanthrene constituents. (18, 19, 20)

Part used: Rhizome.

Pre-clinical studies: Antibacterial.

***Bletilla striata* (Thunb.) Rchb.f.**

Syn: *Bletilla hyacinthine* (Sm.) R.Br.

Common name: Hyacinthina orchid, urn orchid.

Distribution: East Asia: China and Japan.

Botany: *Bletilla striata* is a deciduous terrestrial orchid. The tuberous rhizomes give way to up to 60 cm papery, thin leaves. Light green leaves are plicate and are about 7.5 cm wide (22).

Phytochemistry: Polysaccharide (23).

Parts used: Pseudo bulbs.

Actions: Antibacterial, anti-inflammatory, antiphlogistic, demulcent, pectoral, skin, styptic and vulnerary.

Therapeutics: Internal hemorrhage.

Human study: Vascular emboli zing agent in interventional treatment of primary hepatic carcinoma (24).

***Cypripedium calceolus pubescens* (Willd.) Correll**

Syn: *Cypripedium pubescens* Willd., *Cypripedium parviflorum pubescens* (Willd.) Knight.

Common name: Lady's Slipper orchid.

Distribution: N. America to E. Asia - Japan.

Botany: Plants erect, 70–700 cm. Flowers: sepals greenish or yellowish (often obscured by darker markings); dorsal sepal suborbiculate or ovate to ovate-lance-acuminate, 19–80 × 7–40 mm; lateral sepals connate; synsepal 11–80 × 5–34 mm; petals horizontal to strongly descending, same color as sepals, commonly spirally twisted or undulate, sometimes flat, linear-lanceolate to lance-ovate or oblong, 24–97 × 3–12 mm; lip rather pale to deep yellow, very rarely white, rarely with reddish spots or suffusion on adaxial external surface, 15–54 mm; orifice basal; staminode cordiform-ovoid, deltoid, lance-ovoid, or ovoid-oblong (7).

Parts used: Roots.

Phytochemistry: The active constituents are soluble in alcoholic extract of the plant is known as cypripedin. The plant is reported to contain 1-4 phenanthrenequinone known as cypripedin (7, 25).

Actions: Antispasmodic, diaphoretic, hypnotic, nervine, sedative, tonic. The plant is used as substitute for *Valeriana officinalis* L. although it is inferior (25).

Therapeutics: Diabetes, diarrhea, dysentery, paralysis, convalescence, impotence and malnutrition. (21, 25)

***Dactylorhiza hatagirea* (D.Don) Soo.**

Syn: *Orchis latifolia* L.

Common name: Salampanja, Marsh orchis, salep orchid.

Ayurvedic name: Munjataka.

Distribution: Western Himalayas, Afghanistan and Iran (25, 26).

Botany: *Dactylorhiza hatagirea* is a terrestrial orchid with fleshy tuberous roots. Tubers are slightly flattened, palmately lobed. Stem is usually 30-50 cm tall, leafy and with few sheathing scales in the lower portion. Leaves are erect, oblong-lanceolate, 7-15 cm long, obtuse and with a sheathing base. Flowers are pink-purple, crowded in terminal, spicate racemes (26).

Parts used: Roots.

Phytochemistry: Mucilage, starch, glucoside: loroglossin, albumen, volatile oil and ash (25). Five new compounds known as dactylorhins A-E and two natural compounds known as dactyloses A-B have

been reported from plant growing in Nepal (27).

Actions: Aphrodisiac, expectorant and nervine tonic (25).

Therapeutics: Diabetes, diarrhea, dysentery, paralysis, convalescence, impotence and malnutrition.

***Dendrobium macraei* Auct**

Syn: *Ephemerantha macraei* (Lindl.) Hunt et Sunmeh, *Flickingeria nodosa* (Dalz.) Seiden f.

Ayurvedic name: Jivanti (6), Jeva jevaniya, saka shreshtha, yasasvini, jiva bhadra (25).

Distribution: Himalayas.

Botany: An air plant, growing on jabmul tree, much branching, stems long, pendulous and knotty, with many oblong pseudo bulbs, leaf one, red sessile and long. Flowers white, with a yellow lip 3 or 4 inches in diameter and fragrant.

Parts used: Tubers.

Phytochemistry: α and β jibantic acid and alkaloid: jebantine (25).

Actions: Tonic.

Therapeutics: General debility.

***Dendrobium nobile* Lindl.**

Syn: *Dendrobium lindleyanum*, *Dendrobium coerulescens* (1).

Distribution: Himalayas and China.

Phytochemistry: mucilage, alkaloid: dendrobine (25), 1-4: phenanthrenequinone: denbinobine. Recently gigantol has been reported from methanolic extract of the plant growing in Japan (28). A bibenzyl compound, moscatilin has been isolated from storage stem of the plant (29).

Actions: Antiphlogistic, pectoral, sialogogue, stomachic and tonic (1).

Therapeutics: In Vietnam the plant is used in the treatment of pulmonary tuberculosis, general debility, flatulence, dyspepsia, reduced salivation, parched and thirsty mouth, night sweats, fever and anorexia (30).

Pre-clinical studies: Anti-mutagenic (28).

***Eulophia nuda* Lindl.**

Syn: *Eulophia dabia* (D.Don) Hochr

Common name: Whitton root, Salep.

Ayurvedic name: Mankand.

Distribution: Himalayas.

Botany: The tubers, conical, surrounded with circular marks. The remains of leaflets, yellowish white or of a green colour.

Parts used: Tubers.

Phytochemistry: Phenanthrenes: chief is nudol (31,32).

Actions: Demulcent and anthelmintic.

Therapeutics: Worm infestation and scrofula.

***Eulophia campestris* Wall. Ex Stapf**

Syn: *Eulophia dabia* (D.Don) Hochr

Distribution: Himalayas.

Botany: The tubers, conical, surrounded with circular marks. The remains of leaflets, yellowish white or of a green colour.

Parts used: Tubers.

Phytochemistry: Mucilage (25).

Actions: Demulcent and anthelmintic.

Therapeutics: Worm infestation and scrofula.

***Habenaria edgeworthii* Hook.f. ex Collett.**

Syn: *Habenaria acuminata* Lindl. syn *Platanthera edgeworthii* (Hook.f. ex Collett) R.K. Gupta

Ayurvedic names: Riddhi, Laksmi, Mangala, Rathanga, Risisrista, Saravajanpriya, Siddhi, Sukha, Vasu and Yuga (34).

Distribution: E. Asia - Himalayas. In dry grassy slopes, field borders upto 2800m (26).

Botany: Stem: 30 to 60 cm. high, leafy, stout. Leaves-Ovate, oblong-lanceolate, 4-10 cm long acute, acuminate thick, upper leaves gradually smaller, nerves 5-7, base sheathing. Flowering spike- 7cm to 25 cm long bearing many flowers. Flowers- Yellow-green 1 to 1.5 cm across with lanceolate acute bracts, the lower shorter, the upper longer; than the ovary sepals green, pubescent, the margins slightly fringed; petals yellow thick, erect; lip yellow longer than the sepals concave narrowing to a long strap shaped limb, spur about twice the length of ovary, yellowish-green curving upwards with tip curved down (26).

Ayurvedic dynamics: Sweet in taste and pacifies *vata* and *pitta* but aggravates *kapha*.

Actions: Cooling and spermopiotic.

Therapeutics: Diseases of the blood (26).

Parts used: Leaves and roots (35).

Substitute: *Pueraria tuberosa* DC. (26).

***Habenaria intermedia* D.Don**

Syn: *Habenaria arietina* H.f.

English name: Wild orchid.

Ayurvedic names: Riddhi, Laksmi, Mangala, Rathanga, Risisrista, Saravajanpriya, Siddhi, Sukha, Vasu and Yuga (34, 35, 36).

Distribution: E. Asia - Himalayas. In dry grassy slopes, field borders upto 2600m (25).

Botany: Erect, 25-60 cm high, terete, robust leafy. Leaves- Scattered usually 5, nerved ovate-lanceolate acuminate, cordate at the base. Inflorescence: 2-6 flowered. Flowers: 5 cm across white or greenish-white few, distant. Bracts leaf like lanceolate, acuminate, equal or more than ovary. Sepals persistent, 20-25 mm long, green, spreading tips reflexed, upper one white inside. Petals white, 5-nerved. Lip 3-lobed, longer than sepals, green spur 5-6 cm stout, longer than ovary more or less curved. Side lobes deeply fringed (25).

Ayurvedic dynamics: Sweet in taste and pacifies *vata* and *pitta* but aggravates *kapha* (34).

Actions: Cooling and spermopiotic (34, 35).

Therapeutics: Diseases of the blood (34).

Parts used: Leaves and roots.

Substitute: *Pueraria tuberosa* DC. (26).

***Habenaria pectinata* D.Don**

Distribution: Himalayas.

Common name: Safed musli.

Therapeutics: The leaves are crushed and applied in snake bites. Tubers mixed with condiments are used in arthritis (26).

***Malaxis muscifera* (Lindl.) Kuntze**

Ayurvedic names: Jivaka, Chiranjivi, Dirghayu, Harsanga, Ksveda, Kurchasira, Pranda, Sringaka and Svadu (34, 35).

Distribution: Himalayas 1850 m to 2300 m Himachal Pradesh to Arunachal Pradesh (26).

Botany: *Microstylis muscifera* is a terrestrial, robust herb, up to 25 cm high. Stem tending to be pseudobulbous at base. Leaves –usually 3 may be more, 5-10 cm ovate-lanceolate, acute with prominent veins and light green. Flowers- shortly stalked about 10 mm in diameter, yellowish-green with purple centre. Sepals oblong, 2 lateral rather shorter than the dorsal, margins recurved. Petals linear longer than sepals, margin recurved. Lip-slightly convex, tip notched or bilobulate, auricles straight and slightly overlapping (26).

Phytochemistry: No information.

Ayurvedic dynamics: Sweet in taste, cold in potency, pacifies *vāta* and aggravates *kapha* (33).

Actions: Cooling, febrifuge and spermopiatic (34).

Therapeutics: Bleeding diathesis, burning sensation, fever and phthisis (34,35).

Part used: Bulb (35).

Substitute: *Pueraria tuberosa* DC. (26).

***Malaxis acuminata* D.Don**

Syn. *Microstylis wallichii* Lindl., *Malaxis wallichii* Deb.

Ayurvedic names: Rishbhaka, Bandhura, Dhira, Durdhara, Gopati, Indraksa, Kakuda, Matrika, Visani, Vrisa and Vrisnabha (34).

Distribution: Himalayas 1800 m to 3500 m eastwards to Sikkim (26).

Botany: Stem- 3 to 25 cm high with ovoid pseudo bulbs. Leaves- One or two (unequal) 3-10 x 2-4 cm sessile, ovate to ovate-lanceolate obtuse, narrowed at base to sheathing petiole. Inflorescence-10 to 25 cm long. Flowers- 3-4 mm long, pale-yellow-green, bracts lanceolate shorter than ovary sepals broadly lanceolate. Petals linear shorter than sepals. Lip ovate abruptly pointed, margins thickened. Flowering time- July-August. Tuber- round, shining bearing stem giving shape bullock horn having a similar curvature. The taste is slightly bitter with fat like substance (26, 37).

Phytochemistry: No information.

Ayurvedic dynamics: Sweet in taste, cold in potency, pacifies *vata* and aggravates *kapha* (36).

Actions: Cooling, febrifuge and spermopiatic (35).

Therapeutics: Bleeding diathesis, burning sensation, fever and phthisis ([34, 38]).

Part used: Pseudo bulb (26, 36).

Substitute: *Pueraria tuberosa* DC (26).

***Orchis laxiflora* Lam.**

Syn: *Orchis ensifolia* Vill.

Common name: Oriental Salep, Marsh Orchis.

Distribution: South Europe, North Africa and West Asia.

Botany: *Orchis laxiflora* is a terrestrial orchid with fleshy tuberous roots. Tubers are slightly flattened. Stem contains sheathing scales in the lower portion. Leaves are erect and oblong-lanceolate. Flowers are dark-purple in spicate racemes (1,25).

Phytochemistry: Mucilage.

Actions: Astringent and expectorant.

Therapeutics: Diarrhea, bronchitis and convalescence (25).

Part used: Bulb.

***Vanda spathulata* (L.) Spreng.**

Distribution: Peninsular India and Sri Lanka.

Therapeutics: Powdered flowers are used in the treatment of consumption, asthma and mania (25).

***Vanda tessellata* (Roxb.) Hook. Ex Don**

Syn: *Vanda roxburghii* R.Br.

Common name: Vanda.

Ayurvedic names: Atirasa and Rasna (6).

Distribution: India, Sri Lanka and Burma (25).

Botany: *Vanda tessellata* is an epiphytic orchid, 30-60 cm high, with leafy stem. Leaves are thickly coriaceous, recurved, plicate, obtuse keeled. Flowers are greenish yellow, mottled with brown on the mid lobe of lip with purple caruncles (26).

Phytochemistry: Alkaloid, glucoside, bitter principle, tannins, resin, saponin, sitosterols and colouring matter (40). A glycoside (melianin) and a complex withanolide have been reported from plant growing in Pakistan (44, 45).

Actions: Aphrodisiac, analgesic and nervine tonic (26, 35, 37).

Therapeutics: Paste of leaves is used as application in fevers. It is ingredient of *Rasna Panchaka Quatha*, Ayurvedic formulation used in the treatment of arthritis and rheumatism. Expressed juice of the leaves is used in the treatment of otitis media. The root is used as antidote against scorpion sting and remedy for bronchitis (26).

Parts used: Whole plant.

Pre-clinical studies: Aphrodisiac (41), anti-inflammatory (42), anti-arthritic (43), antimicrobial (45) and wound-healing (46).

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