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THERAPEUTIC VALUE OF INDIAN ORCHIDS

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Abstract

The present paper, a synthesis of different aspects of medicinal orchids, describes these plants in ancient Sanskrit literature and in local drug market; it enlists 88 medicinally important Indian orchids. A list of the alkaloids along with the methods of their extraction and isolation is provided with an emphasis on the Himalayan orchids. The paper also briefly mentions the flavonoids and the fragrances of the orchids. The micropropagation of medicinally important orchids for making life saving medicines is required to meet out the increasing demand.

Introduction

THE *RIGVEDA* , the *Samveda*, the *Yajurveda* and the *Atharvaveda* are the four oldest scriptures of the Sanskrit written in the form of hymns. Though little or more information about plants is given in all the four Vedas, but the *Atharvaveda* mainly deals with medicinal plants where about 280 medicinal plants have been described (Kaushik and Dhiman, 1997). Perhaps the first description of the orchid Rishbak, botanical name *Malaxis acuminata* (*Microstylis wallichii*) was given in the *Atharvaveda*. The most fundamental book of the medicine in Ayurveda (the Indian system of medicine) is known as *Charak Samhita*. The early Arabic writers on medicine referred to *Charak* as an authority and his *magnum opus* was translated into Arabic for the princess of the Barmecides of Baghdad. The translation of, or references to him in Tibetan, Chinese and other languages are also found. His name in ancient sacred literature of India has been used to mean the adherents of a branch of the Vedas.

As many as 36 synonyms of the orchid Ruha also named as Rasna (*Vanda* sp.) have been given in Sanskrit. Each name denotes some specific character of the plant and the majority of these names stand for the ecological habitat of this orchid. Some decipher the morphology of the plant whereas others its medicinal properties. The meanings of some of these synonyms are given here: Gandhamadni-extremely sweet smelling; Parpushta-brought up by somebody else; Parasraya having taken shelter from someone pertaining to its epiphytic habit; Vriksharuha- grass of a tree; Shekhra-thick flower garland, pertaining to its inflorescence; it also means curve of the moon, because of its crescentric leaves; Parvasika- inhabiting on someone else, pertaining to epiphytic nature; Tarurohni-capable of climbing a tree; Keshrupta- like hair of head pertaining to its orderly arranged leaves appearing like two combed locks; Taruruha- grass of a tree; Kamini-extremely pleasing (also means that incites sex); Vrikshbhaksha-that eats a tree; and Neelvarna-pertaining to its blue coloured flowers. *Eulophia campestris* Wall, called Munjatak in Sanskrit; Salabmisri in Hindi and Punjabi, and Salam in Gujarati and Marathi has been used extensively in *Charak Samhita*: in Sutrasthana, Chikitsasthana and Siddhisthana. The orchids have also been described in the Nighantus of Bhavprakash Mishra and Saligram and *Vanda tessellata* (Roxb.) W.J. Hook. ex Don (= *Vanda roxburghii* R.Br.) has been illustrated for Rasna. *Zeuxine strateumatica* called Shwethuli of Ayurveda is also used for its medicinal property.

Orchids in Local Drug Market

A large number of pharmaceutical concerns in Hardwar either manufacture Ayurvedic drugs, in which orchids are used or sell these orchids as raw drugs.

Riddhi-Vriddhi: These are two separate drugs which have been described in *Charak Samhita* and Ayurvedic literature. But now a days, root tubers of *Habenaria* spp. are used for both of these. Riddhi and Vriddhi are also components of *Ashtavarga*, a group of eight drugs. They are also used to prepare *Chyawanprash* linctus.

Jeevak-Rishbak: These are two separate drugs in *Charak Samhita*, but the pseudobulbs of *Malaxis acuminata* D. Don (= *Microstylis wallichi*) are used for both these drugs. These are defined like the horns of a bull in the Sanskrit literature and are also used in the *Ashtavarga*.

Jeewanti: Majority of the Vaidyas use *Flickingeria macraei* (*Dendrobium macraei, Ephemerantha macraei*) because of the golden coloured pseudobulbs of the plants, it has also been referred to as Swarnjeewanti. Sometimes, it is substituted by the pseudobulbs/shoots

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of *Pholidota articulata.*

Rasna: Though *Vanda tessellata* (*Vanda roxburghii*) is the true Rasna, but sometimes it is substituted by *Acampe papillosa* Lindl. (= *Saccolabium papillosum*). But because of the scarcity of *Vanda tessellata*, the leaves of *Pluchea lanceolata* Olives & Hiern (Compositae) are also sold as its substitute.

The other orchids which have been considered of medicinal value are *Cymbidium aloifolium* (L) Swartz, *Zeuxine strateumatica* (L.) Schlechter, *Habenaria commelinifolia* Wall. and *Dendrobium ovatum* L. Kraenzl.

The Ayurvedic Preparations : Common Ayurvedic preparations in which Jeevak-Rishbak and Riddhi-Vriddhi are used, are *Ashtavarga Churna*, *Jeewanio Dashko Mahakshay*, and the *Chyawanprash*. All these three Ayurvedic preparations are tonics. The orchids and their parts used as medicine in India are listed in Table 1.

Table1. List of medicinal orchids.

S.No.	Orchid species	Medicinal Importance	Part used
1.	*Acampe papillosa (Saccolabium papillosum)*	In rheumatism	Roots
2.	*A. praemorsa*	Plant extract is used for the treatment of rheumatism	Roots
3.	*A.wightiana*	Plant yields a bitter tonic used in rheumatism	Whole plant
4.	*Aerides crispum*	Plants are dried, powdered, boiled in neem oil, filtered and 2-3 drops of its oil are put into the ear once at night as a cure for earache	Whole plant
5.	*A.multiflora*	Antibacterial. In Garhwal, leaf paste is applied as poultice on cut and wounds	Leaves, shoot and roots
6.	*A. odorata*	Ground fruit is used for healing wounds. Juice of leaves is used to heal boils in ears and nose	Tubers
7.	*Anoectochilus regalis*	Stem and leaves are one of the ingredients used in certain medicinal oils	Tubers
8.	*A. formosanus*	Anticancerous	Tubers
9.	*A. elatus*	In case of chest and abdominal pains, the water extract of plant is used to relieve the pain	Stems and leaves
10.	*Arundina graminifolia*	Root decoction is used in body ache and as antibacterial	Roots and Rhizome
11.	*Bletilla striata*	Anti-inflammatory, antibacterial and demulcent.	Pseudobulbs
12.	*Bulbophyllum fischeri*	Used in preparation of various Ayurvedic tonic	Tubers
13.	*B. neilgherrense*	As a tonic	Pseudobulbs
14.	*Calanthe plantaginea*	In Garhwal ,leaf paste is applied on sores and eczema. Leaf and pseudobulbs are believed to be aphrodisiac by locals	Leaves and pseudobulbs
15.	*C. triplicata*	Roots are used to cure diarrhoea. Flower extract is taken as pain killer	Roots and flowers
16.	*Cleisosotoma williamsonii*	Provide longevity	Shoots and Leaves
17.	*Coelogyne cristata*	In Garhwal, infusion of pseudobulbs is given in constipation	Pseudobulbs
18.	*C. fuscescens*	Administered orally in stomach ache	Pseudobulbs
19.	*C. corymbosa*	Juice of fresh pseudobulbs heals burn wounds	Pseudobulbs
20.	*Cymbidium aloifolium*	Decoction of plant is used to stop vomiting and diarrhoea. Plants are also used in treatment of	Leaves

Table1. List of medicinal orchids (contd.).

S.No.	Orchid species	Medicinal Importance	Part used
		tumour	
21.	*C. giganteum*	Juice of crushed leaves is used for clotting of blood	Leaves
22.	*C. longifolium*	Salep is used as demulcent. Aqueous solution of dried and powdered pseudobulbs is taken orally empty stomach as an emetic	Pseudobulbs
23.	*Dactylorhiza hatagirea*	Diabetes, diarrhoea, dysentery, paralysis, impotence and malnutrition	Roots
24.	*Dendrobium* sp.	Used in preparation of medicines that relieves pain, as anti-inflammatory, stop vomiting and excessive perspiration	Pseudobolbs
25.	*D. alpestre*	Pimples, boils and other skin eruptions	Shoot/ Pseudobulbs
26.	*D. macraei*	As tonic	Pseudobulbs
27.	*D. nobile*	Pseudobulbs extract is used to cure eye infections and to soothe burns; used in treatment of pulmonary tuberculosis, flatulence, dyspepsia and fever	Pseudobulbs
28.	*D. ovatum*	In stomach ache, laxative and bile secretion	Pseudobulbs
29.	*D. densiflorum*	Leaf contains ayapin, scopoletin and 6-7 dimethoxy coumarin occurring in combination with glucosides used in preparation of various tonics	Leaves and roots
30.	*D. jenkinsii*	Fresh and dried stems are used in preparation of Chinese drug Shih-leu	Stems
31.	*Dienia muscifera*	Decoction is used as tonic to strengthen kidneys	Tubers
32.	*Echioglossum williamsoni*	Terete leaf juice is applied by Monpa tribe to cure swellings of hands and legs and in bone fractures	Leaves
33.	*Epipactis helleborine*	In Garhwal , infusion of leaves is given in intermittent fever. Rhizome regarded as aphrodisiac	Leaves and rhizome
34.	*E. latifolia*	For insanity	Rhizome
35.	*Eulophia campestris*	Worm infestation	Tubers
36.	*E. flaccida*	Prevent miscarriage	Tubers
37.	*E. graminea*	Ear drops	Tubers
38.	*E. herbacea*	Tuber along with honey is used to increase sperm count and reduce liver swelling	Tubers
39.	*E. dabia*	In Garhwal, tuber are given to infants in cough and cold	Tubers
40.	*E. epidendraea*	Dried roots in powdered form are used for the treatment of rabies. The plant extracts are used to cure burns, swelling and tumors and are hypoglycaemic	Tubers
41.	*E. ramentacea*	In weakness and paste of tubers applied on boils	Tubers
42.	*E. nuda*	Raw tubers given orally in rheumatoid arthritis	Tubers
43.	*E. ochreata*	Hypoglycaemic, astringent and aphrodisiac	Tubers

Table1. List of medicinal orchids (contd.).

S.No.	Orchid species	Medicinal Importance	Part used
44.	*Flickingeria macraei*	Pseudobulb juice is administered orally as tonic and stimulant	Pseudobulbs
45.	*Geodorum densiflorum*	Bulb extract is used to treat skin inflammation, tumours	Leaves and roots
46.	*Goodyera repens*	In Garhwal, plant paste externally applied in syphilis (caused by *Treponema pallidum*) and extract is taken as blood purifier	Plant
47.	*Habenaria acuminata*	Tonic	Root
48.	*H. pectinata*	Leaves are crushed and applied in snake bites. Tubers are mixed with condiments are used in arthritis	Leaves and tubers
49.	*H. edgeworthii*	In treatment of blood diseases	Leaves and roots.
50.	*H. intermedia*	In treatment of blood diseases	Leaves and roots.
51.	*H. marginta*	In Garhwal, thoroughly boiled plant extract is given to cure suppressed urination	Plant
52.	*Herminium lanceum*	In Garhwal, extract of plant is given in suppressed urination	Panchang (Whole plant)
53.	*Liparis rostrata*	Stomach Troubles	Pseudobulb/shoot
54.	*L. mannii* (=*L.tenuifolia*)	As emolient and poultice for boils, abscesses and tumours	Roots/ rhizome
55.	*L. zeylanica*	Plant oil is used to treat fractures and sprains in Ayurvedic systems	Whole plant
56.	*L. birchea*	Plant is crushed and used as emollient and for soothing.	Whole plant
57.	*Malaxis muscifera*	Relieves burning sensation and fever. In Garhwal, underground parts used as tonic either made into extract or dried in form of powder	Pseudobulbs
58.	*M. acuminata*	Cooling, febrifuge and as tonic. In Garhwal, pseudobulbs are used in bronchitis	Pseudobulbs
59.	*Nervilia prainiana*	Plant tubers are used for cooling purposes	Tubers
60.	*Orchis latifolia*	Used to cure diarrhoea, bronchitis and act as an astringent	Bulbs
61.	*O. laxiflora*	Tonic (Lehsunia Salab of Ayurved)	Tubers
62.	*O. mascula*	Tonic as Salab Mishri of Ayurved	Tubers
63.	*Paphiopedilum insigne*	Used against amoebic dysentery	Whole plant
64.	*Pecteilis susannae*	To treat boils	Tubers
65.	*Phaius tankervilliae*	Paste of whole plant along with wild ginger is used as medicine in dysentery and to heal bone fractures	Whole plant
66.	*Pholidota imbricata*	Pseudobulb extract is used to cure abdominal pain and rheumatism	Pseudobulbs
67.	*P. chinensis*	Aqueous extract of pseudobulbs is taken for scrofula, feverish stomach-ache, and toothache.	Pseudobulbs

Table1. List of medicinal orchids (contd.).

S.No.	Orchid species	Medicinal Importance	Part used
		Tincture is used for internal bleeding, haemorrhage, asthmatic cough, tuberculosis, and dysentery	
68.	*P. articulata*	Tonic	Shoot
69.	*P. pallida*	Rheumatic pain	Pseudobulbs
70.	*Pleione maculata*	Pseudobulbs used in liver complaints and stomach-ache	Pseudobulbs
71.	*Ponerorchis chusua*	Tubers used for diarrhoea, dysentery and chronic fever	Tubers
72.	*Rhynchostylis retusa*	Paste of whole plant is applied on the body against various skin diseases. Roots are used for rheumatism. The fresh plant is mixed with other medicinal plants to cure asthma and kidney stone	Whole plant.(Vernacular Betungali) given to buffaloes.
73.	*Satyrium nepalense*	In malaria dysentery and as tonic. In Garhwal, rhizome used in diarrhoea and as aphrodisiac	Tubers and Whole plant
74.	*Satyrium sp.*	Tonic	Shoots
75.	*Spiranthes sinensis*	Plant parts are cooked and eaten for kidney stone. In Garhwal, decotion of plant given in intermittent fever and tuber as tonic	Whole plant and Tubers
76.	*Spathoglottis plicata*	Decoction of the boiled plant is used for rheumatism	Whole plant
77.	*Tropidia curculigoides*	Decoction of roots drunk for diarrhoea or the whole plant in association with Ardusia for malaria during the cold stage	Whole plant
78.	*T. angulosa*	The plant extract is used as an effective agent for malaria and it is given after the fever subsides	
79.	*Vanda cristata*	Expectorant	Leaves
80.	*V. coerulea*	Leaf juice is used for cure diarrhoea, dysentery, external application for skin diseases	Leaves
81.	*V. tessellata*	Paste is applied externally on the body to reduce fever. Decoction of root is given for cholera	Roots
82.	*V. testacea*	Leaves are warmed with mustard oil and applied over swollen parts to reduce pain	Leaves
83.	*V. walkeriae*	The plant extract is used as an appetizer and digestive	Whole plant
84.	*Vanilla walkeriae*	Plant extract is used as an appetizer and digestive also	Whole plant
85.	*Zeuxine strateumatica*	Tonic	Roots

Source: Duggal (1971); Gaur (1999); Handa (1986); Hegde and Ingalhalli (1988); Kataki (1986); Kaushik (1983;1985;1988; 1995); Pathak *et al.*, (2010); Puri (1971a,b); Singh *et al.*,(2009). The Sanskrit literature from Atharvaveda, *Charak Samhita*, *Sushrut Samhita*, *Kashyap Samhita*, *Nighantus* of Pandit Bhav Prakash Mishra and Saligram.

Literature studies [Correl (1950), Watt and Breyer-Brandwick (1962); and Handa (1986)] have revealed that several orchids have been used for the pharmaceutical purposes. These include: *i*) *Aplectrum hyemale,* common name Adam and Eve, the roots of which are used for treating boils; *ii*) *Arethusa bulbosa* (Wild pink) roots used for treating toothache; *iii*) *Bletia purpurea* (Pine Pink) corm as tonic and antidote to fish

poisoning; *iv*) *Corallorhiza maculata* (sooted coral root) roots used as diaphoretic, febrifuge and sedative; *v*) *Cypripedium calceolus* var. *pubescens* (Yellow Lady's slipper) root as diaphoretic, nerve stimulant, antispasmodic and for curing epilepsy; and *vi*) *Dendrobium* pseudobulbs/shoot in skin eruptions and infections; *vii*) *Epipactis gigantea* (Giant orchid) root is used to combat mania; *viii*) *E. helleborine* (Bastard helleborine) root for gout, *ix*) *Goodyera oblongifolia* (Rattle snake orchid) leaves for gout; *x*) *G. pubescens* (Downy rattle snake orchid) leaves as antidote to snake and mad dog bite; *xi*) *Habenaria orbiculata* (fragnant orchid, heal-all) root tubers for several diseases of mountainous regions; *xii*) *Leissochilus krebsii* root in scabies and skin eruptions; *xiii*) *Orchis mascula* (Salep) root as aphrodisiac and nerve tonic; *xiv*) *Ponthieva racemosa* (shadow witch) root as substitute of ipecac; *xv*) *Satyrium erectum* tubers as tonic; *xvi*) *Spiranthes diuretica* (Swamp tresses) root as diuretic; *xvii*) *S. autumnale* root as aphrodisiac; and *xviii*) *S. michuacana* leaves and rhizome for fragrance. According to some recently published reports (Balzarini *et al.*, 1992; De Clereq, 1994) some orchids can be used to treat some of the challenging diseases like AIDS caused by HIV. Anti thrombocyte and anti thrombotic effects of *Gastrodia elata* have also been recently reported.

Alkaloids

The alkaloids function as nitrogen waste in plant products as urea and uric acid do in animals; some alkaloids may serve as nitrogen storage, but most of them accumulate and are not further metabolized even under severe nitrogen starvation conditions; the alkaloids may be protecting plants from pathogens, parasites and herbivores; they may serve as growth regulators; and further, alkaloids generally being basic might be involved to replace bases in maintaining the ionic balances. Truly speaking, our present knowledge regarding their physiological role is too scanty.

The alkaloids according to Arthur and Rose (cf. Kaushik, 1983) are basic nitrogenous organic compounds which are usually of vegetable origin and exhibit a powerful toxic action on human and animal system. They constitute a heterogenous group of nitrogen containing compounds. Hegnauer proposed a biogenic definition of alkaloids (cf. Lüning, 1974) that all secondary metabolites containing basic or quarternary nitrogen being of amino acid origin should be classified as true alkaloids and compounds of the same classes biosynthesized from other sources should be called pseudoalkaloids. The alkaloids are usually colourless, crystalline solids having a bitter taste which combine with acids without elimination of water. They are soluble in alcohol, insoluble or sparingly soluble in water. Perhaps, the German pharmacist Stertürner was the first to discover *Morphium* from the opium. He later on described it in detail in 1817, as a basic salt forming substance having the principal physiological action of the drug which was followed by investigation of other alkaloids. The pioneer works on alkaloids from orchids are by De Wildeman in 1892 and De Droong in 1896 (Revised, 1906). Table 2 reports alkaloids present in orchids. The orchid alkaloid *Dendrobine*, however, was isolated by H. Suzuki in 1932 as recorded by Onaka *et al.* (1964). *Dendrobium nobile* was used as a source of material to prepare the Chinese drug 'Chin-Shi-Hu.' This drug has also been used in Japan as a tonic and antipyretic (to reduce fever). It is said that another Chinese drug *Shik Hu* was prepared by Read the source of which is uncertain, but perhaps related to *D. monilforme* and *D. nobile*. Lüning (1974) screened 525 species of orchids for alkaloids, out of which 77% species showed more than 0.01 % alkaloids and 21% species more than 0.1%.

It is also believed by some authors that *Dendrobium moniliforme, D. nobile,* and *Flickingeria macraei (=Ephemerantha macraei, Dendrobium macraei)* constitute *Shik Hu.* But whether *Shik Hu* and *Chin-Shi-Hu* stand for the same or different drugs is not certain. From this drug, Suzuki *et al.* (1932, 1934) isolated dendrobine and an unnamed base. They also obtained dendrobine from D*endrobium linawianum* and recorded the presence of alkaloids in *D. flaviflorum* and *D. tosoensis.* Unlike these, *D. longicalcaratum* produced negative results. The dendrobine ($C_{16}H_{25}O_2N$) crystalises in colourless needles and prisms havin melting point at 134°C. The *Dendrobine* has been regarded to produce moderate hyperglycaemia, diminishes cardiac activity in large doses, lowers blood pressure, depresses respiration, inhibits isolated rabbit intestine and contracts isolated guinea pig uterus. It has a weak analgesic and antipyretic action. The convulsions induced by injection of *Dendrobine* can be controlled by use of sodium isoamylethylbarbiturate and they appear to be control in origin due to action on the cord and medulla. The other alkaloids from orchids as reported by Lüning (1974) are Eria alkaloids, pyrrolizidine alkaloids and *Phalaenopsis* and *Vandopsis* alkaloids. No doubt their therapeutic action remains to be studied. However, *in vitro* antibacterial effect of ethanolic extract of three orchid species *Pholidota articulate, Dendrobium amoenum* and *Cleisostoma micranthum* which gave positive alkaloid test, were studied by Kaushik, 1997; Kaushik and Kishore (1997 and 1997) and Kishore (1995), however, gave satisfactory response against some pathogenic

microorganisms of the gut of the insects and that of human being. The extracts of any other orchid species may also have be found to bear antibacterial activity (Ghanaksha and Kaushik, 1999a,b, 2007).

The alkaloids, generally speaking, whether occurring in free state or as salts of organic acids are extracted from the finely powdered material by means of strong spirit. After distilling off the alcohol, the bases are extracted from the residue by dilute acids librated by the addition of ammonia or sodium carbonate and extracted by chloroform, ether or carbon tetrachloride. This gives the total alkaloids content of the plant except where a quarternary base is present when methods similar to those employed for the simpler natural bases, *e.g.*, precipitation with mercuric chloride or phosphotungstic acid, are utilized. Certain stable alkaloids may be extracted from a mixture of finely powdered plant with lime or magnesia by an organic solvent. In other cases, (*e.g.*, Caffeine in tea) extractions with boiling water may be employed. [See more details Allen's *Commercial Organic Analysis* Vol. VII, 1927, 5-13, and Thorpe and Whiteley (1956)].

The alcoholic extract of the orchids which were collected from the Central Himalayas, were tested for alkaloids by means of Dragendroff's reagent spot test also recommended by Stahl (1969), Mayor reagent test, Bouchardat's (or Wagner's) reagent test and Silicotungstic acid test which include our published work (Kaushik and Kishore, 1991,1997; Kishore 1995) and unpublished work of the author and his students Jugal Kishore, Pawan Kumar, Jitender Singh and Sudhir Saini. Table 3 enlists Himalayan orchids tested for alkaloids.

Table 2. Alkaloids reported in orchids.

S.No.	Alkaloid	Empirical Formula	Orchid species
1.	Dendrobine	$C_{16}H_{25}NO_2$	*Dendrobium nobile, D. linawianum, D. findlayanum*
2.	2-hydroxy dendrobine	$C_{16}H_{25}NO_3$	*D. findlayanum*
3.	6-hydroxy dendrobine	$C_{16}H_{25}NO_3$	*D. nobile*
4.	n- methyl dendrobine	$C_{17}H_{28}NO_2$	*D. nobile*
5.	Dendrobine N-oxide	$C_{16}H_{25}NO_3$	*D. nobile*
6.	n-isopentenyl dendrobium ion	$C_{21}H_{34}NO_2$	*D. nobile*
7.	Nobilonine	$C_{17}H_{27}NO_3$	*D. nobile, D. findlayanum*
8.	6-hydroxy- nobilonine	$C_{17}H_{29}NO_4$	*D. hildebrandii, D. friedericksianum*
9.	Dendrine	$C_{19}H_{29}NO_4$	*D. nobile*
10.	Dendroxine	$C_{17}H_{25}NO_3$	*D. nobile*
11.	4- hydroxyl-dendroxine	$C_{17}H_{25}NO_4$	*D. nobile*
12.	6- hydroxyl-dendroxine	$C_{17}H_{25}NO_4$	*D. nobile*
13.	n-isopentenyl dendroxinium ion	$C_{22}H_{34}NO_3$	*D. friedericksianum*
14.	Dendrowardine	$C_{25}H_{32}NO_4$	*D. wardianum*
15.	1- Phenyl isoquinoline		*Cryptostylis fulva*
16.	Phenylamine/ Methylated Phenylamine		*Eria javensis*
17.	Labournine acetate		*Vanda cristata, V. hindsil*
18.	Mixture of Lindel of dine and labournine acetates		*Vanda helvola*
19.	Phalaenopsin		*Phalaenopsis amabilis*
20.	Nicotine and hygrine		*Vandopsis lissochiloides* (= *Vandopsis parishii*), *Vanda lamellata*
21.	Glucosidil alkaloid		*Malaxis latifolia* Sm. (= *Microstylis congesta, Malaxis congesta*)

Source: Henry (1949); Leander and Lüning (1967); Lüning (1974); Lüning and Leander (1965); and Lüning and Lünding (1967).

Table 3. The Himalayan orchids tested for alkaloids.

S.No.	Orchid species	Trade name	Part used	Result
1.	*Aerides multiflora* Roxb.		Fresh leaf	Positive
2.	*Dendrobium amoenum* Wall. Ex. Lindl	Swarnjeewanti	Fresh shoot	Positive
3.	*Flickingeria macraei* Lindl. (=*Ephemerantha macraei* (Lindl.) Hunt & Summerh., *Dendrobium macraei* Lindl.)		Dry shoot including pseudobulbs	Positive
4.	*Habenaria sp.*	Riddhi-Vriddhi	Dry root tubers	Positive
5.	*Malaxis acuminata* D.Don (= *Microstylis wallichii* Hook f.)	Jeevak-Rishbak	Green pseudobulbs	Positive
6.	*Pholidota articulata Lindl.*		Fresh shoot (Polynodal pseudobulb)	Positive
7.	*Rhynchostylis retusa* Bl.		Fresh leaf	Positive
8.	*Smitinandia micrantha* (Lindl.) (=*Cleisostoma micranthum* K.& .P)		Fresh leaf	Positive
9.	*Vanda testacea* (Lindl.) Reichb. (=*Vanda parviflora*)		Fresh leaf	Positive

Flavonoids

Most of the flavonoids, *e.g.*, flavones, C-glycosides, flavonoids, flavones, 6-hydroxy-flavons and xanthones have been reported from the orchid leaves. The lack of proanthocyanidins represents the advanced feature of the family Orchidaceae (William, 1969) which is of phylogenetic importance too. In comparison to alkaloids, the flavonoids are rather inactive pharmacologically. The quercetin glycoside rutin is only one till the date that is used much in medicine. It has a protective function in preventing capillary fragility. But certainly the economically significant property of flavonoids is their contribution to taste and flavour in food.

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