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MEDICINAL ORCHIDS AND THEIR SIGNIFICANCE IN IMMUNITY DEVELOPMENT

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Abstract

Orchids, one of the largest families of flowering plants, have been long used in traditional medicine systems such as Ayurveda and traditional Chinese medicine. Recent studies have identified them as a rich source of chemical constituents with promising anti-inflammatory, antidiabetic, antiviral, and anticancer properties. Medicinal orchids belong mainly to the genera Calanthe, Coelogyne, Cymbidium, Cypipedium, Dendrobium, Ephemerantha, Eria, Galeola, Gastrodia, Gymnadenia, Habenaria, Ludisia, Luisia, Nevilia, and Thunia. Orchid phytochemicals include stilbenoids, anthraquinones, pyrenes, coumarins, and flavonoids, which play vital roles in immunity development and curing critical ailments. Several orchid species have been used for their immunomodulatory properties in traditional medicine, including Bletilla striata, Corallorhiza maculata, Corymborchis longiflora, Dactylorhiza hatagirea, and Malaxis muscifera. The authors suggest that further studies can identify new biomolecules for developing new therapeutics and expanding the use of traditional remedies to modern medical practices. Orchid's species contain a large number of bioactive phytochemicals that can be used as a promising source of medicine. Orchids can be used in treatment of conditions such as neurodegenerative disorders, anticonvulsive, anticancer, antidiabetic, viral diseases, etc. Orchids have recently been proved to be a rich storehouse of chemical constituents with promising anti-tumor, anti-cancer, and anti-inflammatory activities as revealed in modern biology based studies.

Introduction

Orchids are one of the largest families of flowering plants and are globally distributed. To date, 29,199 species have been accepted [1]. One of the best-known plant groups in the global horticultural and cut flower trades, orchids are also grown and traded for a variety of purposes, including as ornamental plants, medicinal products and food. The medicinal orchids belong mainly to the genera: *Calanthe, Coelogyne, Cymbidium, Cypipedium,*

[1] ICAR-NRC for Orchids, Pakyong, Sikkim

Dendrobium, Ephemerantha, Eria, Galeola, Gastrodia, Gymnadenia, Habenaria, Ludisia, Luisia, Nevilia and *Thunia* [2]. Orchids are commercially used in Chinese and South Asian traditional medicine systems [3]. The most prominently used orchids in traditional Chinese medicines are various *Dendrobium* spp. used to make the drug shi-hu [particularly *D. catenatum* Lindl. (including *D. officinale* Kimura & Migo), *D. loddigesii* Rolfe*, D. moniliforme* (L.) Sw. and *D. nobile* Lindl.)] [4, 3]. Besides, tubers of *Gastrodia elata* Blume, rhizomes of Bletilla striata (Thunb.) Rchb.f.), the rhizomes and stems of *Anoectochilus* spp. and the corms of *Cremastra appendiculata* (D. Don) Makino, *Pleione bulbocodioides*
(Franch.) Rolfe and *P. yunnanensis* (Rolfe) Rolfe are all used [4, 3]. They are also popular to be used in some African traditional medicine (e.g. *Vanilla madagascariensis* Rolfe in Madagascar [5], North American folk medicine (e.g. *Cypripedium acaule* Aiton and *C. parviflorum* Salisb. [6] and the Unani medicine system [e.g. *Dactylorhiza hatagirea* (D.Don) *Soó Vanda tessellata* (Roxb.) Hook. ex G.Don, *Cymbidium bicolor* Lindl. and *Ipsea speciosa* Lindl [7, 8,9].

Orchids in ayurvedic system of medicine

In the Ayurvedic system of medicine, there is one rejuvenating herbal formulation
'Astavarga' is derived from a group of 8 herbs and some of these herbs i.e. jivak (*Microstylis wallichii*), kakoli (*Habenaria acuminata*), riddhi (*H. intermedia*) and vriddhi (*H. edgeworthii*) are orchids [10, 11]. *Flickingeria macraei* is used in 'Ayurveda' in the name of
'jeevanti' which is used as astringent, aphrodisiac and in the treatment of asthma and bronchitis [12]. Other commonly used orchid drugs in the Ayurvedic system are salem (*Orchis latifolia* and *Eulophia latifolia*), jewanti (*Dendrobium alpestre*), shwethuli and rasna
(*Acampe papillosa* and *Vanda tessellata*). In 'Sushruta samhita' it is stated that the underground tuber of *Orchis latifolia* is used in the drug'munjatak'which relieves cough. The leaves of *Vanda roxburghii* have been prescribed in the ancient Sanskrit literature for external application for the treatment of rheumatism, ear infections, fractures and diseases of nervous system. Nepal's Ayurvedic trade has been reported to include 94 orchid species [13, 14], including *Crepidium acuminatum* (D.Don) Szlach., *Habenaria intermedia* D.Don, *Herminium edgeworthii* (Hook.f. ex Collett) X.H. Jin, Schuit., Raskoti & Lu Q. Huang and *Malaxis muscifera* (Lindl.) Kuntze [15, 16, 9]. *Eulophia* spp. are also widely used medicinally in different parts of India [*E. dabia* (D. Don) Hochr*., E. spectabilis* Suresh in D.H. Nicolson, C.R. Suresh & K.S. Manilal (= E. nuda Lindl.) [17] and *D. hatagirea* is used to treat a range of ailments [18].
In some regions of Malaya, the women boil the leaves of *Nervilia aragoana* and drink the liquid immediately after childbirth as a precaution against possible post natal sickness.
Corymborchis longiflora,*Tropidia curculigoides*,and *Acriopsis javanica* are reported as febrifuges in treating malaria.

Chemical ingredients in orchids

Orchid phytochemicals can be classified as Stilbenoids (Stilbene, Bibenzyls, Phenanthrenes, 9,10-Dihydrophenanthrenes, Phenanthraquinones, 9,10-Dihydrophenanthraquinones, Phenanthropyrans and pyrones, 9,10-Dihydrophenanthropyrans and pyrones, Fluorenones), Anthraquinones, Pyrenes, Coumarins, Flavonoids, Anthocyanins and anthocyanidins, Chroman derivatives, Lignans, Simple benzenoid compounds, Terpenoids (Monoterpenes, Sesquiterpenes, Diterpenes, Triterpenes), Steroids, Alkamines, Amino acids, mono- and dipeptides, Alkaloids and higher fatty acids. Dendrobium species are known to give a variety of secondary metabolites such as phenanthrenes, bibenzyls, fluorenones and sesquiterpenes, and alkaloids and are responsible for their wide variety of medicinal properties. Besides, a number of phenanthrenes compounds isolated from

Dendrobium species are dihydrophenanthrene, ephemeranthoquionone, shihunidine, shihunine, dendrophenol, moscatilin, moscatin, denfigenin, defuscin, amoenumin, crepaditin, rotundatin, cumulatin, and gigantol. Some other orchid genera like *Eulophia, Cypripedium, Gastrodia, Bletilla, Bulbophyllum, Anoectochilus, Arundina, Eria, Malaxis, Habenaria, Vanda*, and *Vanilla* are enriched with different important phytochemicals [19] (Table 1).

Table 1. Some chemical constituents from orchids

Sl. No	Chemical name	Plant source	Sl. No	Chemical name	Plant source
1.	Aeridin,	*Aerides crispum*	36.	Cypripedin Cryptostylin	*Cypripedium calceolus, Cypripedium macranthum*
2.	Agrostophyllin	*Agrostophyllum brevipes*	37.	Defuscin, Dendroflorin, Dengidsin, Kaempferol, Naringenin, Taraxerol	*Dendrobium auranticum var. denneanum*
3.	Annoquinone	*Cypripedium macranthum*	38.	Dendrobine, Denbinobin, Dendrobinobine, Dendroside A, Dendroside D, Dendroside E, Dendroside F, Dendroside G, Dendronobiloside A, Nobilin D, Nobilin E, Nobilone	*Dendrobum nobile*
4.	Arundinin, Isoarundinin-I, II, Arundin	*Arundina graminifolia*	39.	Dendrocandin A, B, C, D, E, F, G, H, I	*Dendrobium candidum*
5.	Batatasin III	*Epidendrum rigidum*	40.	Dendrocrepine	*Dendrobium crepidatum*
6.	Blestrianol A, Blestrianol B, Blestrianol C, Bletilol-A, Bletilol-B,	*Bletilla striata*	41. .	Dendrochrysanene, Erianin	*Dendrobium chrysotoxum*
	BlestrinA, B,C,D				

7.	Bulbophythrin A, Bulbophythrin B, 3,7-Dihydroxy-2-4-6trimethoxyphenanthrene,	*Bulbophyllum odoratissimum*	42.	Dendromoniliside A, Dendromoniliside B, Dendromoniliside C, Moniliformin	*Dendrobium monoliforme*
8.	Callosmin, Imbricatin, Orchinol	*Agrostophyllum callosum*	43.	Dendroprimine, Hygrine	*Dendrobium primulinum*
9.	Calanthoside, Isatin, Indican, Glucoindican	*Calanthe discolor and C. liukiuensis*	44.	Denthyrsin, Denthyrsinone, Denthyrsinine, Denthyrsinol, Hircinol	*Dendrobium thyrsiflorum*
10.	Chysin A Chysin B	*Chysis bractescens*	45.	9,10-Dihydro-2,5-Dihydroxy-3, 4-dimethoxyphenanthrene, Erianthridin, Fimbrinol A	*Maxillaria densa*
11.	Chrysotobibenzyl Chrysotoxin	*Dendrobium aurantiacum*	46.	2,3-Dimethoxy-9,10dihydrophenanthrene4,7-diol	*Epidendrum rigidum*
12.	Cirrhopetalanthi n	*Cremastra appendiculata*	47.	Ephemeranthrone, Lonchophylloid A, B, 3-Methylgigantol	*Ephemerantha lonchophylla*
13.	Coelonin, 3,7-Dihydroxy-2,4,8trimethoxyphenanthrene	*Coelogyne elata, Pholidota yunnanensis*	48.	Flaccidin, Flaccidinin, Oxoflaccidin, Isooxoflaccidin	*Coelogyne flaccida*
14.	Coeloginanthrin Coeloginanthridi n CombretastatinC -1, Coelogin	*Coelogyne cristata*	49.	Gigantol	*Cymbidium giganteum Epidendrum rigidum., Scaphyglottis livida, Dendrobium aurantiacum var. denneanum*
15.	Confusarin Coumarin	*Dendrobium aurantiacum*	50.	Gymconopin A, B, D	*Gymnadenia conopsea*
16.	Crepidine, Crepidamine	*Dendrobium crepidatum*	51.	Gymnopusin	*Bulbophyllum gymopus*

17.	Cumulatin Densiflorol A	*Bulbophyllum kwangtungense*	52.	Homoeridictyol, Scoparone, Dendroflorin	*Dendrobium densifiorum*
18.	Isoamoenylin Amoenylin	*Dendrobium amoenum*	53.	Quercetin	*Dendrobium tosaense*
19.	Kuramerine	*Liparis kurameri*	54.	Shihunine,	*Dendrobium*
				Shihunidine	*loddigesii*
20.	Lusianthridin	*Nidema boothii Lindl.*	55.	Sinensol A, B, C, D, E, F, Spirasineol B, Spiranthol-C, Spiranthoquinone	*Spiranthes sinensis var. amoena*
21.	Malaxin	*Malaxis congesta*	56.	Tristin	*Bulbophyllum triste, Dendrobium aurantiacum var. denneanum*
22.	Moscatin, Moscatilin	*Dendrobium moschatum, Dendrobium aurantiacum var. denneanum ,Dendrobium loddiesii*	57.	Thunalbene	*Thunia alba*
23.	N-methylpiperidin e	*Vandopsis longicaulis*	58.	Aloifol-I, CymbinodinA, B	*Cymbidium aloifolium*
24.	Nudol, Eulophiol	*Eulophia nuda*	59.	Erianin, Erianthridin	*Eria carinata*
25.	Ochrone-A, B Ochrolic acid, Ochrolon	*Coelogyne ochracea*	60.	Pendulin	*Cymbidium pendulum*
26.	Phalaenopsine	*Phalaenopsis mannii, Phalaenopsis equestris, Phalaenopsis ambilis*	61.	Agrostonin, Agrostonidin, Callosin, Callosumin	*Agrostophyllum callosum*
27.	Pholidotol A Pholidotol B	*Pholidota chinensis*	62.	Flavanthridin	*Eria flava*
28.	Pieradine	*Dendrobium pierardii, Dendrobium aphyllum*	63.	Shancilin, Shanciol C, D, E, Sanjidin A, B	*Pleione bulbocodioides*
29.	Plicatol B	*Dendrobium plicatile*	64.	Flavidin	*Coelogyne flavida, Flavidinin*
30.	Parviflorin	*Vanda parviflora*	65.	Benzaldehyde	*Zygopetalum mackayi*
31.	Tessalatin	*Vanda tessellata*	66.	Vanillyl methyl ether, Piperidinic acid	*Vanilla planifolia*

32.	Dengibsin, Dengibsinin	*Dendrobium gibsonii*	67.	Cycloartenol	*Catteya sp*
33.	Loroglossin	*Orchis maculata 0. incamata , 0. latifolia*	68.	Parishin, Parishin B, Parishin C, Gastrol	*Gastrodia elata*
34.	Kinsenoside	*Anoectochilus formosanus*	69.	Heptacosane, Octacosano	*Vanda roxburghii*
35.	Habenariol	*Habenaria repens*	70.	Kaempferol-7β-Dglucopyranoside, Isorhamnetin-3-O β-Dglucopyranoside, Quercetin	*Anoectochilus roxburghii*

Pharmacological properties of orchids

Antimicrobial: *Vanilla planifolia, Galeola foliata, Cypripedium macranthos var. rebunense, Spiranthes mauritianum, Bletilla striata*

Anti-inflammatory: *Anoectochilus formosanus, Gastrodia elata, Dendrobium moniliforme, Pholidota chinensis, Vanda roxburghii*

Anti-oxidant: *Anoectochilus formosanus, Anoectochilus roxburghii, Dendrobium moniliforme, D. nobile, Gastrodia elata.*

Antidiabetic: *Anoectochilus formosanus, Dendrobium candidum*

Antihepatotoxic: *Anoectochilus formosanus*, *Goodyera* species

Neuroprotective*:* *Coeloglossum viride, Gastrodia elata*

Anti-viral: Cymbidium hybrid*, Epipactis helleborine*, *Listera ovata*, *Gastrodia elata*

Antipyretic: *Dendrobium moniliforme*

Anti cancer/Anti-tumor*: Anoectochilus formosanus, Bletillastriata, Bulbophyllum kwangtungense, Dendrobium chrysanthum, Dendrobium fimbriatum, Dendrobium nobile, Ephemerantha ionchophylla, Gastrodia elata, Spiranthes australis, Bulbophyllum odoratissimum*

Orchids with immunomodulatory action

Bletilla striata: Tuber is used to treat tuberculosis and haemorrhage. In China and Japan, it is used in wound healing, ulcers, inflammation, haemostatic and as immunomodulator [20]. ***Corallorhiza maculata***: Dried stems are used to restore blood in pneumonia patients in America and Europe [19].

Corymborchis longiflora: In Malayasia, it is used as febrifuge in treating malaria [19]. ***Dactylorhiza hatagirea***: Tuber is used in burning sensation during urination, general debility, cough and cold, while decoction of tuber mixed with sugar is used as a drink in tuberculosis and effective against impotency [21].

Dendrobium aurantiacum: In China, herb is used as antipyretic, immunomodulatory, antiageing and in eye disorders.

Dendrobium candidum: Herb is used to strengthen stomach capacity, promote body fluid; used in the treatment of cataract, throat inflammation and immune boosters [22].

Dendrobium chrysanthum: Powdered dry leaves are used to treat eye related problems, skin diseases, as immunomodulator and antipyretic [23].

Dendrobium denudans: In Tibet, Amchi people used the stem for cough, cold, nasal block and tonsillitis. The Nepali folk healers used it as tonic to increase the strength of old people and children [21].

Dendrobium nobile: Sesquiterepenes glycosides with alloaromadendrane, emmetin and picrotoxane types aglycones are isolated from stems of *Den. nobile*. These compounds show immunomodulatory activity [24].

Eulophia ochreata: Tubers are used to combat general fatigue, to boost immunity, to treat constipation, fever, skin diseases, wounds, tumours, boils, sunburns, cuts, injury and abdominal pain.
Habenaria edgeworthii: Leaves and tubers are used in blood and skin diseases, coughs, cold, asthma, leprosy, gout, general debility and as brain tonic and rejuvenator [25].
Malaxis muscifera: Powdered bulbs are used in treating male fertility while decoction is used in fever [21].
Satyrium nepalense: In Sikkim, tubers are used for reducing cold, cough and fever and mixed with yak ghee, used as aphrodisiac. Plant is used to proper child development and growth [21]. **Conclusions**
Pharmacological studies on orchids indicate the immense potential of these plants in treatment of conditions such as neurodegenerative disorders, anticonvulsive, anticancer, antidiabetic, viral diseases etc. However, gaps in studies carried out are apparent which need to be bridged in order to exploit full medicinal potential of orchids. Orchids have recently been proved to be a rich storehouse of chemical constituents with promising anti-tumor, anticancer and anti-inflammatory activities as revealed in modern biology based studies. Investigations in progress can identify new biomolecules that confirm usefulness of traditional remedies to develop new therapeutics. Orchid's species have recently been targeted for many investigations related to their chemical, biological, pharmacological, and medical properties. Traditional use of orchids preparation of Yin tonic in the Chinese, Tibetian and Ayurvedic medicine needs to be revised in the light of modern science of health and diseases. It is true that many people of developing countries from rural now preferring traditional medicines over synthetic ones because of least side effect, low production cost, easy availability and wide effectiveness. Meanwhile, consumers in developed countries are becoming disillusioned with modern health systems and are seeking alternatives. Since herbal medicines serve the health needs of about 80% of the world's population, and orchids contain a large number of bioactive phytochemicals can be used as a promising source of medicine.
References

Govaerts R, Bernet P, Kratochvil K, Gerlach G, Carr G, Alrich P, Pridgeon AM, Pfahl J, Campacci MA, Holland Baptista D, Tigges H, Shaw J, Cribb P, George A, Kreuz K, Wood JJ. 2017. World checklist of Orchidaceae. Kew: Facilitated by the Royal Botanic Gardens.Available at: http://apps.kew.org/wcsp/ (accessed 23 March 2017).

Szlachetko D.2001. Genera et species Orchidalium. 1. Polish Bot. J. 46: 11-26.

Leon C, Lin Y-L. 2017. Chinese medicinal plants, herbal drugs and substitutes: an identification guide. Kew: Kew Publishing.

Teoh ES. 2016. Medicinal orchids of Asia. Cham: Springer.

Randriamiharisoa MN, Kuhlman AR, Jeannoda V, Rabarison H, Rakotoarivelo N, Randrianarivony T, Raktoarivony F, Randrianasolo A, Bussmann RW. 2015. Medicinal plants sold in the markets of Antananarivo, Madagascar. Journal of Ethnobiology and Ethnomedicine 11: 60.

Henkel A. 1906. Wild medicinal plants of the United States (No. 89). Washington, DC: US Department of Agriculture, Bureau of Plant Industry. Government Printing Office.

Jayaweera DMA, Fosberg FR. 1980. A revised handbook to the flora of Ceylon – complete set. Rotterdam: A.A Balkema.

Thakur M, Dixit VK. 2007. Aphrodisiac activity of Dactylorhiza hatagirea (D.Don) Soo in Male Albino rats. Evidence-Based Complementary and Alternative Medicine 4: 29–31.

Khajuria AK, Kumar G, Bisht NS. 2017. Diversity with ethnomedicinal notes on orchids: a case study of Nagdev forest range, Pauri Garhwal, Uttarakhand, India. Journal of Medicinal Plants 5: 171–174.

Handa SS. 1986. In: Vij SP, editor. Biology, conservation and culture of orchids. New Delhi: East West Press; p. 89–100.

Singh A, Duggal S. 2009. Medicinal orchids: An overview. Ethnobotanical leaflets, 13:351-363.

Kirtiker KR, Basu BD. 1975. Indianmedicinalplants,seconded, IV.Dehradun, India: Bishen Singh Mohendra Pal Singh.

Acharya KP, Rokaya MB. 2010. Medicinal orchids of Nepal: are they well protected? Our Nature 8: 82–91.

Subedi A, Kunwar B, Choi Y, Dai Y, van Andel T, Chaudhary RP, de Boer HJ, Gravendeel B. 2013. Collection and trade of wild-harvested orchids in Nepal. Journal of Ethnobiology and Ethnomedicine 9: 64.

Hossain MM. 2009. Traditional therapeutic uses of some indigenous orchids of Bangladesh. Medicinal and Aromatic Plant Science and Biotechnology 42: 101–106.

Dhyani A, Nautiyal BP, Nautiyal MC. 2010. Importance of Astavarga plants in traditional systems of medicine in Garhwal, Indian Himalaya. International Journal of Biodiversity Science, Ecosystem Services & Management 6: 13–19.

Jalal JS, Jayanthi J, Kumar P. 2014. Eulophia spectabilis: a high value medicinal orchid under immense threat due to overexploitation for medicinal use in Western Ghats, Maharastra. The MIOS Journal 15: 9–15.

Pant S, Rinchen T. 2012. Dactylorhiza hatagirea: a high value medicinal orchid. Journal of Medicinal Plants Research 6: 3522–3524.

Hossan, MM. 2011. Therapeutic orchids: traditional uses and recent advances — An overview. Fitoterapia 82: 102–140.

He X, Wang X, Fang J, Zhao Z, Huang, Linhong Guo H, Zheng X. 2017. Bletilla striata: Medicinal uses, phytochemistry and pharmacological activities. Journal of Ethnopharmacology 195: 20-38.

Panda AK, Mandal D. 2013. The folklore medicinal orchids of Sikkim. Ancient Science of Life, 33: 2.

Wang Y, Liu D, Chen S, Wang Y, Jiang H, Yin H. 2014. A new glucomannan from Bletilla striata: structural and antifibrosis effects. Fitoterapia 92: 72–78.

Gutiérrez RMP. 2010. Orchids: A review of uses in traditional medicine, its phytochemistry and pharmacology. Journal of Medicinal Plants Research Vol. 4(8), pp. 592638.

Ye Q, Qin G, Zhao W. 2002. Immunomodulatory sesquiterpene glycosides from Dendrobium nobile. Phytochemistry. 61: 885-890.

Jalal JS, Kumar Pankaj, Pangtey YPS. 2008. Ethnomedical orchids of Uttarakhand, Western Himalaya. Ethnobotanical Leaflets, 12: 1227-1230.