WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 10, Issue 4, 261-270. Review Article ISSN 2277– 7105

AN OVERVIEW - THERAPEUTIC ORCHIDS, TRADITIONAL USES AND RECENT ADVANCES

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Article Received on
31 January 2021,

Revised on 21 Feb. 2021,
Accepted on 11 March 2021

DOI: 10.20959/wjpr20214-20014

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ABSTRACT

Orchids are biggest and most various group among angiosperms. Orchids have been used as a source of medicine for millennia to treat different diseases and ailments including tuberculosis, paralysis, stomach disorders, chest pain, arthritis, syphilis, jaundice, cholera, acidity, eczema, tumour, piles, boils, inflammations, menstrual disorder, spermatorrhea, leucoderma, diahorrhea, muscular pain, blood dysentery, hepatitis, dyspepsia,bone fractures, rheumatism, asthma, malaria, earache, sexually transmitted diseases, wounds and sores. Besides, many orchidaceous preparations are used as emetic, purgative, aphrodisiac, vermifuge, bronchodilator, sex stimulator, contraceptive, cooling agent and remedies in scorpion sting and snake bite. Some of the preparations are supposed to have miraculous curative properties but rare scientific demonstration available which is a primary requirement for clinical implementations. Incredible diversity, high alkaloids and glycosides content, research on orchids is full of potential. Meanwhile, some novel compounds and drugs, both in phytochemical and pharmacological point of view have been reported from orchids. Linking of the indigenous knowledge to the modern research activities will help to discover new drugs much more effective than contemporary synthetic medicines. Phytochemically some orchids have been reported to contain alkaloids, triterpenoids, flavonoids and stilbenoids. Ashtavarga (group of eight medicinal plants) is energetic part of Ayurvedic formulations like Chyvanprasha and four plants viz, Riddhi, Vriddhi, Jivaka and Rishbhaka have been discussed as possible members of family Orchidaceae. Newly there has been tremendous advancement in

medicinal plants research; nevertheless orchids have not been exploited fully for their pharmaceutical application.

KEYWORDS: Orchids, Orchidaceae, Medicinal Plants, Ayurveda.

INTRODUCTION

Orchidaceae is one of the biggest families among angiosperms. Affording to one assessment the family includes 800 genera and 25,000 species.[1] Orchids are well known for their financial importance and widely cultivated for ornate purposes. Orchids are cosmopolitan in distribution. *Vanilla planifolia* is commercially imperious orchid as it is source of vanillin used as a food stuff flavouring.[2]

PLANT PROFILE

Orchis laxiflora is a bulb mounting to 0.8 m (2ft 7in). It is hardy to zone (UK) 5 and is not frost tender. It is in floret from May to June. The species is hermaphrodite (has both male and female organs) and is self-fertilized by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: acid, neutral and basic (alkaline) soils. It cannot grow in the shade. It desires moist or wet soil.

Figure: Flower of *Orchis laxiflora.*

Scientific classification

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Monocots

Order: Asparagales

Family: Orchidaceae

Subfamily: Orchidoideae

Genus: *Orchis*

Species: A. laxiflora

Medicinal Uses

It has been used as a diet of singular value for children and patients, being boiled with water, salted and prepared in the same mode as arrow root. Rich in mucilage, it forms a soothing and demulcent jelly that is used in the dealing of irritations of the gastro-intestinal canal. One part of salep to fifty parts of water is sufficient to make a jelly. The tuber, from which salep is prepared, should be collected as the plant dies down after blossoming and setting seed.[3]

Historical aspects

The term orchid was coined by Theophrastus as framework of the plants resemble with testicles.Greek word orchid factually 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 . Traditional Chinese medicine widely utilizes orchids in medicines. A few of them have been subjected to phytochemical and pharmacological studies. In India wok has been carried out on chemical analysis of some medicinally useful orchids. *Eulophia campestris*, *Orchis latifolia*, *Vanda roxburgii* are some important plants to mention.[4] *Dendrobium macraei* is another important orchid from Ayurvedic point of view as it is reported to be source of Jivanti.[5] *Cypripedium parviflora* is widely used as aphrodisiac and nervine tonic in Western Herbalism (1;3). Asthavarga is important ingredient of various classical Ayurvedic formulations like Chavyanprasa. Out of eight constituents of Ashtavarga, four have been reported to be orchids (Table 1.). Table 1 shows eight medicinal plants used in Ashtavarga, composite Ayurvedic formulation. The plants marked with stars have been reported to be orchids.

Table 1: Medicinal plants used in Ashtavarga.

S. No.	**Ayurvedic name**	
Botanical name	**Family**	**Part used**
1. Jivaka* *Malaxis muscifrea*	Orchidaceae	Bulb
2. Rishbhaka* *Malaxis acuminate*	Orchidaceae	Pseudo-bulb
3. Meda *Polygonum verticilliatum*	Polygonaceae	Rhizome
4. Mahameda *Polygonum cirrifolium*	Polygonaceae	Rhizome
5. Kakoli *Roscoea procera*	Zingiberaceae	Root
6. Kshira Kakoli *Fritillaria royeli*	Liliaceae	Root

7. Riddhi* *Habenaria intermedia*	Orchidaceae	Root
8. Vriddhi* *Habenaria edgeworthii*	Orchidaceae	Root

Many therapeutic orchids are reported to contain alkaloids. Antimicrobial activities of some orchids have been suggested although detailed surveys are still warranted.[6] Recent works have reported remoteness of anthocyanins, stilebnoids and triterpenoids from orchids. Orchinol, hircinol,cypripedin, jibantine, nidemin and loroglossin are some imperious phytochemicals reported from orchids. Some of the phytochemicals secluded from orchids along with biological source have been tabulated in Table 2.

Table 2: Important phytochemicals isolated from orchids.

Name of phytochemical	Phytochemical class Source
1. Aeridin Phenanthropyran	*Aerides crispum*
2. Agrostophyllinol Triterpenoid	*Agrostophyllum brevipes*
3. Agrostophyllinone Triterpenoid	*Agrostophyllum brevipes* and Agrostophyllum callosum
4. Isoagrostophyllol Triterpenoid	*Agrostophyllum callosum*
5. Orchinol, 6- methoxycoelonin,	*Agrostophyllum callosum*
6. Arundinan Stilbenoid	*Arundina graminifolia*
7. Cypripedin 1-4 phenanthrenequinone	*Cypripedium calceolus pubescens*
8. Loroglossin Glucoside	*Orchis latifolia*
9. Jebantine Alkaloid	*Dendrobium macraei*
10. Gigantol Bibenzyl	*Dendrobium nobile*
11. Moscatilin Bibenzyl	*Dendrobium nobile*
12. Dendrobine Alkaloid	*Dendrobium nobile*
13. Anthocyanins	*Dracula chimaera*
14. Nudol Phenanthrene	*Eulophia nuda*
15. Melianin Glycoside	*Vanda roxburghii*
16. Nidemin Triterpenoid	*Nidema boothi* and *Scaphyglottis*
17. Kinsenoside Glycoside	*Anoectochilus formosanus*
18. Rotundatin and moscatin Phenanthrene	*Dendrobium moscatum*
19. Gymopusin Phenanthrene	*Bulbophyllum gymopus*

Phytochemical

Phytopharmaceuticals are produced from fresh or dried plants, or part of plants, by expression, distillation and other operations. Natural ingredients present in herbal medicines are more easily and more readily metabolised by the body. Therefore, they produce fewer or no side effects however pharmaceuticals made from chemical compounds are prone to adverse side effects.[1]

Phytopharmaceuticals should always contain the active principles together with coexisting materials from the source plant, these additional materials having a greater or lesser beneficial influence upon the activity of the drug. A phytopharmaceuticals may frequently

not represent the final dosage form administered to the patient. Dry extract is further processed to produce powder mixtures, tablets, suppositories and other dosage forms. They are also considered to be intermediate or semi-finished products whose technical qualities are conductive to further processing. For example, de-enzymized gum acacia and gum tragacanth are also considered as phytopharmaceuticals.[7]

Analysis is the application of a process or series of processes in order to identify and/or quantify a substance, components of a solution or mixture, or the determination of the structure of chemical compounds. There are mainly two types of analysis: Qualitative analysis which provides information about the identity of atomic or molecular species or functional groups in the sample and Quantitative analysis which gives numerical information about the quantity of one or more of this component.[3,4]

Spectroscopy

Spectroscopy is the investigation of the interaction between electromagnetic radiation and matter. The most important consequence of such interactions is that energy is absorbed or emitted by the matter in discrete amount is called quanta. The absorption or emission processes are known throughout the electromagnetic spectrum ranging from the gamma region to the radio region. When the measurement of radiation frequency is done experimentally, it gives value for the change of energy involved and from this one may draw the conclusion about the set of possible discrete energy levels of the matter.[8,9]

Chromatographic techniques in herbal drug analysis

Chromatography represents the most versatile separation technique and readily available. Chromatography is defined as technique of isolation and identification of components or compounds or mixture of it's into individual components by using stationary phase and mobile phase. Plant materials are separated and purified by using various chromatographic techniques. Herbal medicine is a complicated system of mixtures. Thus, the methods of choice for identification of' botanical drug' are mainly intended to obtain a characteristic fingerprint of a specific plant that represent the presence of a particular quality defining chemical constituents.

Chemical fingerprints obtained by chromatographic technique and especially by hyphenated chromatography, are strongly recommended for the purpose of quality control of herbal medicines, since they might represent appropriately the "chemical integrities" of the herbal

medicines and therefore be used for authentication and identification of the herbal products. Thin layer chromatography (TLC) and High Performance Thin Layer Chromatography (HPTLC) are valuable tools for qualitative determination of small amounts of impurities. Also many analytical techniques such as Volumetric Analysis, Gravimetric Determinations, and Gas Chromatography (GC), Column Chromatography (CC), High Performance Liquid Chromatography (HPLC) and Spectro photometric methods are also frequently used for quality control and standardization.[10]

Thin Layer Chromatography

Thin layer chromatography is simply known as TLC. It is one of the most popular and simple chromatographic technique used of separation of compounds. In the phytochemical evaluation of herbal drugs, TLC is being employed extensively for the following reasons:

1. It enables rapid analysis of herbal extracts with minimum sample cleanup requirement.
2. It provides qualitative and semi quantitative information of the resolved compounds.
3. It enables the quantification of chemical constituents. Fingerprinting using HPLC and GLC is also carried out in specific cases.

In TLC fingerprinting, the data that can be recorded using a high performance TLC (HPTLC) scanner includes the chromatogram, retardation factor (RF) values, the color of the separated bands, their absorption spectra, λ max and shoulder inflection/s of all the resolved bands. All of these, together with the profiles on derivatization with different reagents, represent the TLC fingerprint profile of the sample. The information so generated has a potential application in the identification of an authentic drug, in excluding the adulterants and in maintaining the quality and consistency of the drug.

High Performance Thin Layer Chromatography (HPTLC)

HPTLC technique is widely employed in pharmaceutical industry in process development, identification and detection of adulterants in herbal product and helps in identification of pesticide content, mycotoxins and in quality control of herbs and health Food. It has been well reported that several samples can be run simultaneously by use of a smaller quantity of mobile phase than in HPLC. It has also been reported that mobile phases of pH 8 and above can be used for HPTLC. Another advantage of HPTLC is the repeated detection (scanning) of the chromatogram with the same or different conditions. Consequently, HPTLC has been investigated for simultaneous assay of several components in a multicomponent formulation.

With this technique, authentication of various species of plant is possible, as well as the evaluation of stability and consistency of their preparations from different manufactures.

High Performance Liquid Chromatography (HPLC)

Over the past decades, HPLC has received the most extensive application in the analysis of herbal medicines. Reversed phase (RP) columns may be the most popular columns used in the analytical separation of herbal medicines. Preparative and analytical HPLC are widely used in pharmaceutical industry for isolating and purification of herbal compounds. There are basically two types of preparative HPLC: low pressure HPLC (typically under 5 bar) and high-pressure HPLC (pressure >20 bar). The important parameters to be considered are resolution, sensitivity and fast analysis time in analytical HPLC whereas both the degree of solute purity as well as the amount of compound that can be produced per unit time i.e. throughput or recovery in preparative HPLC.

In preparative HPLC (pressure >20 bar), larger stainless steel columns and packing materials (particle size 1030μm are needed. The examples of normal phase silica columns are Kromasil 10 μm, Kromasil 16 μm, Chiralcel AS 20 μm whereas for reverse phase are Chromasil C18, Chromasil C8,YMC C18. The aim is to isolate or purify compounds, whereas in analytical work the goal is to get information about the sample. This is very important in pharmaceutical industry of today because new products (Natural, Synthetic) have to be introduced to the market as quickly as possible. Having available such a powerful purification technique makes it possible to spend less time on the synthesis conditions.[11]

Ultra-high performance liquid chromatography (UHPLC)

In recent years, UHPLC has been emerging as a feasible technique for the quality control of herbal products. UHPLC can withstand a pressure of at most 8000 psi and it brings liquid chromatographic analysis to another level by hardware modifications of the conventional HPLC machinery. UHPLC makes it possible to perform high-resolution separations superior to HPLC analysis by using solid phase particles of less than 2 μ m in diameter to achieve superior sensitivity and resolution. Smaller particle size leads to higher separation efficiency and shorter columns size leads to shorter analysis time with little solvent consumption[12]. Within a period of last few years, UHPLC fingerprints of herbal products were developed instead of conventional HPLC approach.[13-14] In comparison to HPLC, UHPLC analyses reported a decreased analysis time by a factor up to eight without loss of information. The

results obtained not only showed decreased analysis time but also proved a great enhancement in selectivity compared to conventional HPLC analysis.[15-16]

Gas chromatography (GC)

GC is a well-established analytical technique commonly used for the Characterization, quantization and identification of volatile compounds. It can be used in many different fields such as pharmaceuticals, cosmetics and even environmental toxins. Since the samples have to be volatile, human breath, blood, saliva and other secretion containing large amounts of organic volatiles can be easily analyzed using GC. The powerful separation efficiency and sensitive detection make GC a useful tool for the analysis of essential oils.[17] Despite its advantages, GC analysis of herbal products is usually limited to the essentials oils because of possible degradation of thermo-labile compounds and the requirement of volatile compounds makes GC unsuitable for many herbal compounds.[18] The hyphenation of GC–MS leads to reducing analysis times of essential oils.

CONCLUSION

Moreover, thousands of disease specific medicines already developed by the grace of modern science and technology, it could not diminish the demand of traditional medicine especially to millions of people in the vast rural areas of developing countries. It is due to some good properties of traditional medicines over synthetic medicines as i) least side effect, ii) low production cost, iii) easy availability and wide effectiveness. Meanwhile, consumers in developed countries are becoming disillusioned with modern healthcare 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. For this purposes orchidaceous preparations should typically been subjected to the precise scientific clarification and standardization to confirm traditional wisdomin the light of a rational phytotherapy.

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