RESEARCH ARTICLE

MEDICINAL AND AROMATIC ORCHIDS - AN OVERVIEW

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ABSTRACT

There are about 25,000 species of orchids estimated to occur in the world. In India, about 1350 species belonging to 186 genera represent approximately 5.98% of the world orchid flora and 6.83% of the flowering plants in India. The Eastern Himalayas and North Eastern, North West Himalayas, Peninsular India and Andaman & Nicobar Islands are the major orchid regions of India. Some orchid species like Dendrobiummobile, Eulophiacampestris, Orchislatifolia, Vanda roxburghii and Vanda tessellate have been documented for their medicinal value. Phytchemically, orchids have been reported to contain alkaloids, triterpenoids, flavonoids and stilbenoids. Ashtavarga, a group of eight medicinal plants, is a vital part of Ayurvedic formulations like Chyvanprasha and four of these plants viz.Riddhi, Vriddhi, Jivaka and Rishbhaka belong to the family Orchidaceae. In the present study, medicinal parts and properties of more than 30 orchid species and importance of a number of aromatic orchids have been reviewed.

INTRODUCTION

Orchids are the most diverse group among the angiosperms and phytochemically, orchids have been reported to contain alkaloids, triterpenoids, flavonoids and stilbenoids. Orchids are widely used in traditional Chinese medicines. In India, work has been carried out on chemical analysis of some medicinally important orchids like Eulophiacampestris, Orchislatifolia, Vanda roxburghii. Throughout the ages, several health-promoting benefits, including diuretic, anti-rheumatic, anti-inflammatory, anti-carcinogenic, hypoglycemic activities, antimicrobial, anticonvulsive, relaxation, neuroprotective, and antivirus activities have been reported to the use of orchids extracts. Orchid fragrance is a relatively volatile substance found in plants. It is stored as essential oils in special cells (osmophores) at the periphery of flowers, leaves or roots. It has been estimated that as many as 75% of all orchids are 'fragrant'. They emit detectable chemical compounds - some extremely fragrant while in some instances they are extremely repulsive smells.

Medicinal orchids

Orchids are the most diverse group among the angiosperms and are cultivated for attractive flowers. There is no doubt that the Chinese were the first to cultivate and describe orchids, and they were almost certainly the first to describe orchids for medicinal use. Reinikka in 1995 reports a Chinese legend that Shên-nung described Bletillastriatata and a Dendrobiumspecies in his MateriaMedica of the 28th century BC. Some species like Dendrobiummobile, Eulophiacampestris, Orchislatifolia, Vanda roxburghii and Vanda tessellate have been documented for their medicinal value (Bhattacharjee and De, 2005). Phytochemically, orchids have been reported to contain alkaloids, triterpenoids, flavonoids and stilbenoids. Ashtavarga, a group of eight medicinal plants is vital part of Ayurvedic formulations like Chyvanprasha and four plants viz, Riddhi, Vriddhi, Jivaka and Rishbhaka belong to family Orchidaceae (Table 1). Orchids are widely used in traditional Chinese medicines. In India, work has been carried out on chemical analysis of some medicinally important orchids like Eulophiacampestris, Orchislatifolia, Vanda roxburghii. Dendrobiummacraei is another important orchid used in Ayurvedic medicine as it is reported to be source of Jivanti. Cypripedium

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parviflora is widely used as aphrodisiac and nerve tonic in Western herbal medicines. Many medicinal orchids are reported to contain alkaloids and have antimicrobial activities. Recently, studies have indicated on isolation of anthocyanins, stilbenoids and triterpenoids from orchids. Orchinol, hircinol, cypripedin, jibantine, nidemin and loroglossin are some important phytochemicals extracted from orchids. Some of the medicinal orchids along with distribution, parts used, and medicinal properties have been tabulated below (Gutierrez, 2010; Singh and Duggal, 2009; Rao, 2004) (Table 2).

Pharmacological Profile of Orchids

Throughout the ages, several health-promoting benefits, including diuretic, anti-rheumatic, anti-inflammatory, anti-carcinogenic, hypoglycemic activities, antimicrobial, anticonvulsive, relaxation, neuroprotective, and antivirus, activities have been reported to the use of orchids extracts. Orchid species attributed to medicinal properties of various ailments are given below (Gutierrez, 2010):

**Anti cancer/Anti-tumor**
- Anoectochilusformosanus
- Bletillastriata
- Bulbophyllumkwangtungense
- Dendrobiumumchraysanthum
- Dendrobiumfimbriatum
- Dendrobiummoniliforme
- Ephemeranthaiachyphonphylla
- Gastrodiaelata
- Spiranthesaustrialis
- Bulbophyllumodoratissimum

**Convulsive diseases**
- Gastrodiaelata,
- Goodyeraschlechtendaliana
- Anoectochilusformosanus

**Anti-microbial**
- Vanilla planifolia,
- Galeolafoliata,
- Cypripediummacranthosvar. Rebunense,
- Spiranthesaemauritianum,
- Gastrodiaelata

**Anti-inflammatory**
- Anoectochilus formosanus
- Gastrodiaelata
- Dendrobiummoniliforme
- Pholidota chinensis

**Antioxidant**
- Anoectochilus formosanus
- Anoectochilusroxburghii
- Dendrobiumamoenum
- Dendrobiummoniliforme
- Gastrodiaelata
- Pholidota yunnanensis

**Antidiabetic**
- Anoectochilusformosanus,
- Dendrobiumcandidum

**Diuretic**
- Cymbidiumgoeringii

**Antihepatotoxic**
- Anoectochilusformosanus
- Goodyeraschlechtendaliana
- Goodyeramatsumurana
- Goodyera discolor

**Neuroprotective**
- Coeloglossum viride
- Gastrodiaelata

**Pain treatment**
- Maxillaria densa
- Scaphyglottislivida
- Epidendrum mosenii

**Anti-viral**
- Epipactishelleborine
- Listera ovata
- Gastrodiaelata
- Cymbidium spp

**Relaxation**
- Scaphyglottislivida
- Gastrodiaelata
- Maxillariadensa

**Antiplatelet aggregation**
- Dendrobiumloddigesii
- Dendrobiumdensiflorum
- Ephemeranthaiachyphonphylla
- Gastrodiaelata

**Anti-allergic:** Gymnadeniaconopsea

**Antipyretic:** Dendrobiummoniliforme

**Antimutagenic activity:** Anoectochilusformosanus

**Ameliorative:** Anoectochilusformosanus

**Anthemintic:** Bletillastriata

**Anti-aging:** Coeloglossumviride var. bracteatum

**Gastric:** Dendrobiummoniliforme, Gastrodiaelata

**Herbicidal agent:** Epidendrumrigidum

**Maturation:** Anoectochilusformosanus

**Phytoalexin:** Coelogynecnristata

**Skin blood flow:** Calanthe discolor

**Wound healing:** Vandaroxburghii
Table 1. Medicinal plants used in Ashtavarga, composite Ayurvedic formulation
(Singh and Duggal, 2009)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Ayurvedic name</th>
<th>Botanical name</th>
<th>Family</th>
<th>Part used</th>
<th>Medicinal properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Jivaka</td>
<td>Malaxismuscifera</td>
<td>Orchidaceae</td>
<td>Bulb</td>
<td>Root is used for rheumatism, sciatica, neuralgia, syphilis and uterine diseases.</td>
</tr>
<tr>
<td>2.</td>
<td>Risabhaka</td>
<td>Malaxisacuminata</td>
<td>Orchidaceae</td>
<td>Pseudo-bulb</td>
<td>Its plants are powdered, boiled in neem oil, filtered, 2-3 drops of oil are put into the ear once at night as a cure for earache.</td>
</tr>
<tr>
<td>3.</td>
<td>Moda</td>
<td>Polygonumverticillatum</td>
<td>Polygonaceae</td>
<td>Rhizome</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Mahameda</td>
<td>Polygonumcirrhifolium</td>
<td>Polygonaceae</td>
<td>Rhizome</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Kakoli</td>
<td>Roscoeproceras</td>
<td>Zingiberaceae</td>
<td>Root</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>KhishraKakoli</td>
<td>Fritillariaroyeli</td>
<td>Liliaceae</td>
<td>Root</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Riddhi</td>
<td>Habenariaintermedia</td>
<td>Orchidaceae</td>
<td>Root</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Vridhii</td>
<td>Habenariaedgeworthii</td>
<td>Orchidaceae</td>
<td>Root</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Medicinal orchids and their medicinal properties

<table>
<thead>
<tr>
<th>No.</th>
<th>Botanical Name</th>
<th>Distribution</th>
<th>Parts used</th>
<th>Medicinal properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acampepapillosa</td>
<td>North Eastern India</td>
<td>Roots</td>
<td>Root is used for rheumatism, sciatica, neuralgia, syphilis and uterine diseases.</td>
</tr>
<tr>
<td>2</td>
<td>Acampepraemorsa</td>
<td>Western Ghats of India</td>
<td>Roots</td>
<td>Anti-rheumatism</td>
</tr>
<tr>
<td>3</td>
<td>Aeridescrispum</td>
<td>Western Ghats of India</td>
<td>Whole plant</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Aeridesmultiflorum Roxb</td>
<td>Himalayas (Garhwal to Sikkim), Assam, India and Burma</td>
<td>Tubers</td>
<td>Antibacterial</td>
</tr>
<tr>
<td>5</td>
<td>Anoectochilusformosanus Hayata</td>
<td>Taiwan</td>
<td>Tubers</td>
<td>Chest and abdominal pains, diabetes, fever, nephritis, hypertension, impotence, liver spleen disorders, and pleurodynia, anti-inflammatory agent</td>
</tr>
<tr>
<td>6</td>
<td>Arundina graminifolia (D. Don) Hochr.</td>
<td>Himalayas of Nepal, Sri Lanka, Thailand, Laos, Cambodia, Vietnam, southern China, Japan, Taiwan and south to Malayas and Java</td>
<td>Rhizome</td>
<td>Antibacterial</td>
</tr>
<tr>
<td>7</td>
<td>Bletilla striata (Thunb.) Rehb.f.</td>
<td>Taiwan, Nepal, Tibet, China</td>
<td>Tuber</td>
<td>Treatment of sores, ulcers and chappedskin, heal wounds, reduce swelling, and promote regeneration of tissue</td>
</tr>
<tr>
<td>8</td>
<td>Calanthe triplicata</td>
<td>North East India</td>
<td>Roots, flowers &amp; pseudobulbs</td>
<td>Roots are ingredient of local medicine to treat swollen hands; with other ingredients roots chewed for diarrhea, Flowers as a painkiller in caries, Pseudobulbs as a masticatory, gastrointestinal disorders.</td>
</tr>
<tr>
<td>9</td>
<td>Coelogyne ovalis</td>
<td>Western Ghats of India</td>
<td>Whole plant</td>
<td>The whole plant is used in Western and Southern parts of India for cough, urinary infections and eye disorders.</td>
</tr>
<tr>
<td>10</td>
<td>Cypripedium calceolus subsecens (Wild.) Correll ex Dendrobiumchrysanthum</td>
<td>N. America to E. Asia - Japan</td>
<td>Roots</td>
<td>Antispasmodic, diaphoretic, hypnotic, nerve, sedative, tonic</td>
</tr>
<tr>
<td>11</td>
<td>Dendrobiumenochirisi</td>
<td>China</td>
<td>Leaves</td>
<td>Antipyretic, eyes-benefiting, immuno-regulatory purposes, skin diseases</td>
</tr>
<tr>
<td>12</td>
<td>Dendrobiummacroaeii Auct</td>
<td>North East India</td>
<td>Stems</td>
<td>Fresh and dried stems used in preparation of Chinese drug Shih-hu</td>
</tr>
<tr>
<td>13</td>
<td>Dendrobiummacrantha Lindl.</td>
<td>Himalayas</td>
<td>Tubers</td>
<td>Tonic for general debility</td>
</tr>
<tr>
<td>14</td>
<td>Dendrobiummobile Lindl.</td>
<td>Himalayas and China</td>
<td>Stems</td>
<td>Antiphlogistic, pectoral, sialogogue, stomachic and tonic</td>
</tr>
<tr>
<td>15</td>
<td>Dendrobiumovatum</td>
<td>Western Ghats of India</td>
<td>Stems</td>
<td>Juice obtained by hand crushing the stems is used on patients suffering from constipation and stomachache</td>
</tr>
<tr>
<td>16</td>
<td>EpidendrumMosseni</td>
<td>China&amp;Korea</td>
<td>Stems</td>
<td>Analgesic</td>
</tr>
<tr>
<td>17</td>
<td>Eulophianumadind Lindl.</td>
<td>Himalayas</td>
<td>Tubers</td>
<td>Demulcent and anthelmintic</td>
</tr>
<tr>
<td>18</td>
<td>Gastrodiaelata</td>
<td>Asia</td>
<td>Whole plant</td>
<td>Treatment of epilepsy</td>
</tr>
<tr>
<td>19</td>
<td>Goodyeraschlechtendaliana</td>
<td>India</td>
<td>Whole plant</td>
<td>Tonic for internal injuries and to improve circulation</td>
</tr>
<tr>
<td>20</td>
<td>Habenaria edgeworthii Hook.f. ex Collett.</td>
<td>E. Asia - Himalayas</td>
<td>Leaves &amp; roots</td>
<td>Cooling and spermopiotic</td>
</tr>
<tr>
<td>21</td>
<td>Habenaria pectinata D.Don</td>
<td>Himalayas</td>
<td>Leaves &amp; tubers</td>
<td>The leaves are crushed and applied in snake bites. Tubers mixed with condiments are used in arthritis</td>
</tr>
<tr>
<td>22</td>
<td>Malaxisacuminata D.Don</td>
<td>Himalayas 1800 m to 3500 m eastwards to Sikkim</td>
<td>Pseudobulb</td>
<td>Cooling, febrifuge and spermopiotic</td>
</tr>
<tr>
<td>23</td>
<td>Malaxismuscifera (Lindl.) Kuntze</td>
<td>Himalayas 1850 m to 2300 m Himachal Pradesh to Arunachal Pradesh</td>
<td>Bulb</td>
<td>Cooling, febrifuge and spermopiotic</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Country</th>
<th>Part Used</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.</td>
<td>Maxillariadensa</td>
<td>Mexico</td>
<td>Whole plant</td>
<td>Treatment of painful complaints. Relaxant agent</td>
</tr>
<tr>
<td>25.</td>
<td>Orchis latifolia L.</td>
<td>Western Himalayas, Afghanistan and Iran</td>
<td>Roots</td>
<td>Treatment of diabetes, diarrhea, dysentery, paralysis, convalescence, impotence and malnutrition</td>
</tr>
<tr>
<td>26.</td>
<td>Orchis laxiflora Lam.</td>
<td>South Europe, North Africa and West Asia</td>
<td>Bulb</td>
<td>Treatment of diarrhea, bronchitis and convalescence</td>
</tr>
<tr>
<td>27.</td>
<td>Satyrium nepalense</td>
<td>North East India</td>
<td>Tubers</td>
<td>Tubers eaten by Monpa tribe for Malaria, dysentery, also aphrodisiac</td>
</tr>
<tr>
<td>28.</td>
<td>Spathoglottisiplicata</td>
<td>North East India</td>
<td>Whole plant</td>
<td>Decoction of the boiled plant used for rheumatism and used in hot as a foment.</td>
</tr>
<tr>
<td>29.</td>
<td>Spiranthessinensis var. amoena</td>
<td>Nepal, China &amp; Taiwan</td>
<td>Roots</td>
<td>Aphrodisiac, treatment of hemoptysis, epistaxis, headache, chronic dysentery and meningitis</td>
</tr>
<tr>
<td>30.</td>
<td>Vanda roxburghii</td>
<td>India</td>
<td>Leaves &amp; roots</td>
<td>The paste applied to the body to bring down fever. The juice is dropped in the ear for the treatment of otitis. The roots are used in dyspepsia, bronchitis, rheumatism and sciatica</td>
</tr>
<tr>
<td>31.</td>
<td>Vanda tessellata (Roxb.) Hook. Ex Don</td>
<td>India, Sri Lanka and Burma</td>
<td>Whole plant</td>
<td>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 sued in the treatment of otitis media. The root is used as antidote against scorpion sting and remedy for bronchitis</td>
</tr>
<tr>
<td>32.</td>
<td>Vanilla planifolia</td>
<td>Mexico</td>
<td>Sheath</td>
<td>Used as for the treatment of hysteria, fever, impotence, rheumatism, and to increase the energy, of muscular system</td>
</tr>
</tbody>
</table>

### Aromatic Orchids (De, 2014)

Orchid fragrance is a relatively volatile substance found in plants. It is stored as essential oils in special cells (osmopheres) at the periphery of flowers, leaves or roots. Only small amounts are present as the substance can be toxic to the plant. These fragrant oils can consist of volatile compounds (Table 3). Being volatile, it readily changes into vapour at ordinary temperature, allows us to smell them.

#### Scent Production

It has been estimated that as many as 75% of all orchids are ‘fragrant’. They emit detectable chemical compounds - some extremely fragrant while in some instances they are extremely repulsive smells. Only some of the odoriferous compounds released by a flower are detectable by the human sense of smell, since these are complex substances closely related to the body chemistry of the pollinator they are ‘supposed’ to attract. Fragrances are produced in specialized glands (osmopheres) which can be located anywhere on a flower or bud, depending on function. These are glands of intense physiological activity and are a large drain on the plant's energy. When non-fragrant flowers become isolated geographically fragrance may evolve as a pollinator attractant.

There is, for example, a fragrant form of *Phalaenopsis amabilis* from New Guinea, although all other known forms of the species from other locations are without scent. All flower parts can produce odours, from sepals and petals to calluses and basal spurs. Osmopheres in orchids may be diffuse and function only in very general attraction, or they are confined to certain regions of the flower so that pollinators are attracted to these specific areas and collect or deposit pollinia in the process. Scent glands are most often situated on the lip e.g. *Stanhopea, Herschelia* and *Catasetum*. Members of the *Catasetinae* and *Gongorinae* subtribes produce the most voluminous quantities of scent known amongst orchids. The fragrance of *Catasetum* flowers is interrupted within a few hours of pollination to conserve energy by limiting osmopheric activity. The intricate flowers of the scented Gongorae last only for two or three days but compensate for this by several opening in succession. It is found that if the lip (where the scent is produced) is removed, the flower lasts for two to three weeks. A urine-like smell is produced at the tips of the long tepals in *Phragmipedium caudatum* and could this be to attract the ants who aid in pollination. The long tails of the sepals of *Cirrhoptepalum ornatus* give rise to an odour of whale oil, while the lip smells of fresh herring.

Orchid floral fragrances are produced in a daily cycle with the time of maximum fragrance production generally during the time when the pollinator of that species would be active. Fragrance production requires energy. Therefore the timing of scent production often coincides with the time of visitation of...
pollinators to use the least energy to achieve the maximum effect. Lady of the Night orchid (*Brassavolanodosa*) will perfume a warm Summer’s evening with its heavy fragrance. The medicinal sweet odour is released shortly after sunset, reaching maximum strength around midnight, and fading quickly after sunrise.

The scent release is strictly a light-controlled phenomenon and regulated by a photochrome trigger. Fragrances may change throughout the day both quantitatively and qualitatively as well as from day to day:

*Clowesiarosea* smells of Vicks Vapo rub in the morning and cinnamon in the afternoon. *Catasetumexpansum* smells of turpentine in the morning and rye bread in the afternoon. Bee-pollinated flowers are fragrant early in the day. *Cattleyaluteola*, for example, is very fragrant between 4:00 and 8:00 am. Some orchids such as *Epidendrumdifforme* are moderately fragrant throughout the day with a peak fragrance production at night. Others such as *Epidendrumfalcatum*, change fragrance quality and intensity during the day, from the delicate, haunting scent of jasmine in the morning to a stronger note resembling that of Easter lilies or narcissi during the afternoon.

Fragrant compounds can be manufactured synthetically and used to attract pollinators in the field. This helps to identify pollinators where field observations may be lacking. *Rhyncolaelia (Brassavola) digbiana* is a wonderfully fragrant and handsome parent producing a strong lemon-like perfume. *Rhyncolaeliaglaucia* emits a rosy-floral scent. *Neofinetiafalcata*, which is fragrant during the day and night, awards most of its progeny with fragrance.

**Other Examples of Aromatic Orchids**


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