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Abstract
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Vascular Epiphytic Medicinal Plants as Sources of Therapeutic Agents: Their Ethnopharmacological Uses, Chemical Composition, and Biological Activities

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Abstract: This is an extensive review on epiphytic plants that have been used traditionally as medicines. It provides information on 185 epiphytes and their traditional medicinal uses, regions where Indigenous people use the plants, parts of the plants used as medicines and their preparation, and their reported phytochemical properties and pharmacological properties aligned with their traditional uses. These epiphytic medicinal plants are able to produce a range of secondary metabolites, including alkaloids, and a total of 842 phytochemicals have been identified to date. As many as 71 epiphytic medicinal plants were studied for their biological activities, showing promising pharmacological activities, including as anti-inflammatory, antimicrobial, and anticancer agents. There are several species that were not investigated for their activities and are worthy of exploration. These epipythes have the potential to furnish drug lead compounds, especially for treating cancers, and thus warrant indepth investigations.

Keywords: epiphytes; medicinal plants; phytochemistry; pharmacology; drug leads

1. Introduction

Epiphytes are plants that grow on other plants and are often known as air plants. They are mostly found in moist tropical areas on canopy tree-tops, where they exploit the nutrients available from leaf and other organic debris. These plants exist within the plantae and fungi kingdom. The term epiphyte itself was first introduced in 1815 by Charles-François Brisseau de Mirbel in “Eléments de physiologie végétale et de botanique” [34]. Epiphytes can be categorized into vascular and nonvascular epiphytic plants; the latter includes the marchantiophyta (liverworts), anthocerotophyta (hornworts), and bryophyta (mosses). The common epiphytes are mosses, ferns, liverworts, lichens, and the orchids. Epiphytes fall under two major categories: As holo- and hemi-epiphytes. While orchids are a good example of holo-epiphytes, the strangler fig is a hemi-epiphyte. Although geological studies have proposed the existence of epiphytes since the pleistone epoch, an epiphyte was first depicted in “the Badianus Manuscript” by Martinus de la Cruz in 1552, which showed the Vanilla fragrans, a hemi-epiphytic orchid, being used by the tribal communities in latin America for fragrance and aroma, usually hung around their neck [34].
Epiphytes have been a source of food and medicine for thousands of years. Since they grow in a unique ecological environment, they produce interesting secondary metabolites that often show exciting biological activities. There are notable reviews on non-vascular epiphytes, bryophyta, regarding their phytochemical and pharmacological activities [35–38]. There are also extensive reviews on epiphytic lichens covering secondary metabolites and their pharmacological activities [39–42]. The only available review on vascular epiphytes related to medicinal uses was focused on Orchidaceae [43]. Therefore, to the best of our knowledge, there is no extensive database of vascular epiphytes regarding their medicinal contribution.

There are 27,614 recorded species of vascular epiphytes belonging to 73 families and 913 genera [44]. Vascular epiphyte species are commonly found in pteridophyta, gymnosperms, and angiosperms plant groups, which are mostly found in the moist tropical areas on canopy tree tops, where they exploit the nutrients available from leaf and other organic debris [45,46]. In this study, information on vascular epiphytic medicinal plant species was collected using search engines (Web of Science, Scifinder Scholar, prosea, prota, Google scholar), medicinal plant books (Plant Resources of South-East Asia: Medicinal and Poisonous Plants [47–49], Plant Resources of South-East Asia: Cryptogams: Ferns and Fern Allies [50], Mangrove Guide for South-East Asia [51], Medicinal Plants of the Asia-Pacific [52], Medicinal Plants of the Guiana [53], Indian Medicinal Plants [54,55], Medicinal Plants of Bhutan [56], Medicinal and aromatic plants of Indian Ocean islands: Madagascar, Comoros, Seychelles and Mascarenes [57]), and the Indonesian Medicinal Plants Database [58]. Scientific names of the epiphytic medicinal plant species were compared against the Plantlist database for accepted names to avoid redundancy [59]. The time-frame threshold for data coverage was from the earliest available data until early 2020. Nevertheless, empirical knowledge regarding traditional medicinal plants was passed through generations using verbal or written communication, with verbal communication highly practiced by remote tribes [60,61]. It is possible that some oral traditional medical knowledge may not be reported and therefore not captured in this review. In this current study, we collected and reviewed 185 epiphytic medicinal plants reported in the literature, covering ethnomedicinal uses of epiphytes, their phytochemical studies and the pharmacological activities. The data collection approach used is presented in Figure 1.

![Figure 1. Schematic data collection approach.](image)

2. Ethnopharmacological Information of Vascular Epiphytic Medicinal Plants

2.1. Vascular Epiphytic Medicinal Plant Species Distribution within Plant Families

In this component of the study, we collated and analysed 185 of the medicinally used epiphytic plants species using ethnopharmacological information. This data (Table 1) includes the name of species, plant family, areas where the epiphytes are used in traditional medicines, part(s) of the plant being used in medication, how the medicine was prepared, and indications. Of the 185 medicinally used epiphytes, 53 species were ferns (mostly polipodiaceae), with 132 species belonging to the non-fern category. The Orchidaceae family contains the Dendrobium genus that contains the highest number of medicinal epiphytes, including 64 orchid species and 20 Dendrobium species. The
Orchidaceae epiphytes were the majority of non-fern epiphytes. *Cassytha filiformis* L., *Bulbophyllum odoratissimum* (Sm.) Lindl. ex Wall., *Cymbidium goeringii* Rchb.f. Rchb.f., *Acrostichum aureum* Limme, and *Ficus natalensis* Hochst. were the five most popular vascular epiphytic medicinal plants used (Figure 2).

![Figure 2](image_url)

**Figure 2.** Five most popular medicinal epiphytes. (A) *C. filiformis* L. (B) *B. odoratissimum* (Sm.) Lindl. ex Wall. (C) *C. goeringii* (Rchb.f.) Rchb.f. (D) *A. aureum* Limme. (E) *F. natalensis* Hochst.

### 2.2. Distribution of Vascular Epiphytic Medicinal Plant Species by Country

Based on the available records, the data curation and analysis revealed that the Indigenous Indonesians have used 58 diverse epiphytic medicinal plant species throughout the archipelago and have the highest record compared to other tropical countries (Figure 3). China is second and is well known for its traditional medicine, including the use of epiphytes in medicament preparation. This is followed by the Indigenous Indians, with the well-established Ayurveda as a formal record of Indian medicinal plants. The traditional medicinal plant knowledge of Indonesia has been heavily influenced by Indian culture and enriched by Chinese and Arabian traders since the kingdom era [60].

![Figure 3](image_url)

**Figure 3.** Density map showing a number of epiphytic medicinal plant species used by different countries. The number of species used is proportional to colour intensity.

### 2.3. Parts of Vascular Epiphytic Medicinal Plant Species Used in Traditional Medicines

This review determined that leaves were the main plant components used in the traditional medicines (Figure 4). This was expected given they are more easily harvested (without excessive
tools) and processed compared to other plant parts, e.g., the root and stem. As some epiphytes have a small biomass compared to higher trees, the whole plant is commonly harvested in medicament preparation. Interestingly, almost half of epiphytic medicinal plants were ferns, in which the stem-like stipe is prepared for medicine. Without haustoria (a specialised absorbing structure of a parasitic plant), the root and rhizome of epiphytic medicinal plants are easily harvested and prepared.

Figure 4. Components of epiphytic plants used in medicinal preparations (represented in percentages). LF: leaf; WP: whole; RT: root; ST: stem, RZ: rhizome; FT: fruit; PdB: pseudobulbs; BK: bark; LT: latex; TB: tuber; PT: pith; SD: seed; SP: spore; BD: buds; BL: bulbs; NT: nutmeg; PD: pedi; PdTB: pseudotuber; STh: sheath.

2.4. Modes of Preparation and Dosage of Administration of Vascular Epiphytic Medicinal Plant Species in Traditional Medicines

Generally, medicinally active secondary metabolites have a water solubility problem likely related to the lipophilic moieties in their structures [62]. Using boiling water, decoctions are able to increase the yield of secondary metabolites extracted from medicinal plants. Therefore, it is not surprising that decoctions are commonly used in traditional medicine preparations from plants (Figure 5). External applications are also commonly practiced in traditional medicinal therapies, including poultice (moist mass of material), raw, or less processed medicine. Poultices were commonly prepared for skin diseases while a decoction was ingested for internal infectious diseases (i.e., fever).
Figure 5. Modes of preparation and administration of epiphytic medicinal plants (represented in percentages).

2.5. Category of Diseases Treated by Vascular Epiphytic Medicinal Plant Species

Interestingly, epiphytes have been used for treating various ailments, including both infectious and non-infectious diseases. Traditional communities described infectious diseases related to skin diseases (wounds, boils, ulcers, abscesses, smallpox) and non-skin diseases (fever, diarrhoea, ulcers, colds, worm infections, and malaria). A total of 54 epiphytic medicinal plant species were prescribed to treat skin diseases while 81 species to treat non-skin infectious diseases (Figure 6).

Figure 6. Number of epiphytic medicinal plant species used traditionally to treat infectious diseases.

Hygiene has been a serious issue in traditional communities as it gives rise to infectious diseases. Fever is a common symptom of pathogenic infection and has been treated using medicinal plants, including epiphytes. Hygiene issues are also a common cause of skin disease, wounds, dysentery, and diarrhoea in traditional communities.
3. Phytochemical Composition of Vascular Epiphytic Medicinal Plants

Epiphytes belong to a distinctive plant class as they do not survive in soil and this influences the secondary metabolites present. Epiphytes are physically removed from the terrestrial soil nutrient pool and grow upon other plants in canopy habitats, shaping epiphyte morphologies by the method in which they acquire nutrients [63]. Nutrients, such as nitrogen and phosphorus, are obtained from different sources, including canopy debris (through fall) and host tree foliar leaching [63], the latter influencing canopy soil nutrient cycling [64,65]. In the conversion of sunlight into chemical energy, the epiphyte often uses a specific carbon fixation pathway (CAM: Crassulacean acid metabolism) as a result of harsh environmental conditions [66], making them unique and thus worthwhile for scientific studies.

In the early 20th century, laboratory-based research on epiphytes studied the plant’s production of alkaloids, cyanogenic, and organic sulfur compounds, with the plants producing limited quantities of these compounds [67]. Common plant steroids, e.g., β-sitosterol, have been shown to be present in 22 different epiphytic medicinal plants (Figure 7). This is possibly due to the function of the steroids as structural cell wall components, giving rise to a wide distribution across plant families and species. A further example of a common plant steroid present is stigmasterol.

![Figure 7. Number of epiphytic medicinal plant species producing the same secondary metabolites.](image)

Table 2 lists the secondary metabolites identified in epiphytic medicinal plants and details the species, isolated compounds, and provides references. Currently, only 69 species have been phytochemically studied (23 fern and 46 non-fern epiphytes) and 842 molecules have been isolated from these epiphytic plants. Analysis of the literature showed epiphytes were able to produce a range of secondary metabolites, including terpenes and flavonoids, with no alkaloids being isolated from epiphytic fern medicinal plants thus far. β-Sitosterol, a common phytosterol in higher plants, was reported across fern genera. Interestingly, there is one unique terpene produced, hopane, which is commonly called fern sterol. Common flavonoids, such as kaempferol, quercetin, and flavan-3-ol derivatives (catechin), were also reported across the epiphytic ferns. Epiphytic pteridaceae,
Acrostichum aureum Limme, is rich in quercetin [68]. Further analysis showed there were more secondary metabolites reported from non-fern epiphytic medicinal plants than from fern epiphytic medicinal plants, including terpene derivatives, flavonoids, and alkaloids. Included were flavanone, flavone, and flavonol derivatives but no flavan-3-ols were reported in these epiphytes so far. In the non-fern epiphytes, there were more phytochemical studies on orchid genera with additional classes of compounds reported, including penantrene derivatives (flavanthrinin, nudol, fimbriol B) [69,70] from the Bulbophyllum genus and the alkaloid dendrobine from the Dendrobium genus [71].

Therefore, while epiphytes may have limitations in accessing nutrients, adaptation has enabled them to successfully survive these environments. Studies on numerous medicinal epiphytes show that the unique environment does not constrain the plants from producing different types of secondary metabolites. These include terpenes, flavonoids, and alkaloids, especially the non-fern epiphytic medicinal plants.

4. Pharmacological Activities of Vascular Epiphytic Medicinal Plants

The pharmacological activities of medicinal epiphytes are summarised in Table 1, including the plant species, ethnopharmacological indication, and pharmacological test results. The ethnopharmacological uses of each plant are also present for a correlation and comparison with the pharmacological activities. There are a large number of phytochemical studies on the four fern-epiphytes (Stenochlaena palustris (Burm. F.) Bedd., Botrychum lanuginosum Wall.ex Hook & Grev., Pyrrosia petiolosa (Christ) Ching, Psilotum nudum (L.) P. Beauv) without any biological activity testing reported. This occurred to four non-fern epiphytes (Bulbophyllum vaginatum (Lindl.) Rchb.f, Mycaranthus pamea (Lindl.) S.C.Chen & J.J.Wood, Pholidota articulata Lindl., Viscum ovalifolium DC) and non-fern epiphytic medicinal plants. This lack of pharmacological testing limits scientific support for the traditional uses of these plants.

From the 191 collected records of epiphytic medicinal plants, around 71 species were subjected to bioactivity testing, with 25 of these species using crude extract samples. Although this testing represents almost 50% of the species examined, only a few of the pharmacological tests were related to ethnopharmacological claims. Here, we discuss selected species where the outcomes indicated a coherent relationship between bioactivities and traditional claims.

4.1. Infectious Disease Therapy

Research on epiphytes that have been used in infectious disease therapy include in wound healing, dysentery, and skin infections. A study on the methanol extract of Adiantum caudatum L., Mant showed anti-fungal activity against common fungi found in wounds (Aspergillus and Candida species) [72], including Aspergillus flavus, A. spinulosus, A. nidulans, and Candida albicans, with minimum inhibitory concentration (MIC) values of 15.6, 15.6, 31.2, and 3.9 µg/mL, respectively. Gallic acid was one of the bioactive constituents [73]. The methanol extract of Ficus natalensis Hochst (a semi-epiphytic plant) showed anti-malarial activity against Plasmodium falciparum, with an half maximal inhibitory concentration (IC\textsubscript{50}) value of 41.7 µg/mL, and weak bactericidal activity against Staphylococcus aureus, with an MIC value of 99 µg/mL [74]. These results became preliminary data for confirming its traditional uses as malarial fever therapy and wound healing. Phytochemical studies on Pyrrosia sheareri (Bak.) Ching successfully isolated several compounds and were subjected to antioxidant testing. While this was not in line with the plant’s ethnomedical uses for dysentery therapy [75], one of the isolated constituents was protocateuchic acid, which is known to possess anti-bacterial activity. It implies that the traditional uses of the epiphyte were for bacillary dysentery therapy.

4.2. Non-Infectious/Degenerative Disease-Related Therapy

An exploration on Drynaria species, highly prescribed in bone fracture therapy, successfully isolated flavonoid constituents that induce osteoblast proliferation [76]. Previous studies on Acrostichum aureum Limme failed to show its anti-bacterial activities [77] contrary to its traditional claims in wound management. However, patriscabratine 257 was isolated from the defatted
methanol extract of whole plant of *A. aureum*, and subsequent testing showed it possessed anti-cancer activity in gastric cells and this supported the traditional use of the plant in peptic ulcer therapy [68]. A decoction from the epiphyte *Ficus deltoida* has been used to treat diabetes. A study on the hot aqueous extract of this plant revealed anti-hyperglycemic activity by stimulating insulin secretion up to seven-fold. Furthermore, its activity mechanism was related to both the $\text{K^+}$-dependant and -non-dependant insulin secretion pathway [78]. However, further studies are required to identify the constituents responsible for the anti-hyperglycaemic activity.

The Indigenous people of Paraguay have used *Catasetum barbatum* Lindley to topically treat inflammation. Four bioactive compounds were isolated from this species and 2,7-dihydroxy-3,4,8-trimethoxyphenanthrene (confusarin) 595 showed the highest anti-inflammatory activity [79]. The study also revealed the compound to be a non-competitive inhibitor of the $\text{H}_1$-receptor.

From the polypodiaceae family, the rhizome of *Phymatodes scolopendria* (burm.) Ching has been used to treat respiratory disorders. A bioassay-guided phytochemical study on *Phymatodes scolopendria* (Burm. f.) Pic. Serm. isolated 1,2-benzopyrone (coumarin) 209 as a bronchodilator [80].

5. Epiphytic Plant–Host Interactions on Secondary Metabolite Tapping

Secondary metabolite tapping has been an interesting study to reveal the molecular interactions between epiphytes and their host. This interaction was more visible when a physical channel between the two were developed. This channel (haustorium) made an epiphytic plant act as a parasite that enabled the plant to harvest molecular components from the host plant. A study on *Scurulla oortiana* (Korth.) Danser growth in three different host species (*Citrus maxima*, *Persea Americana*, and *Camellia sinensis*) identified three secondary metabolites (quercitrin, isoquercitrin, and rutin) in the *S. oortiana* (Korth.) Danser epiphyte growing on the three hosts [81]. Interestingly, extensive chromatographic and spectroscopic studies discovered that the flavonoids found in the *S. oortiana* (Korth.) Danser were independent of the host plants [81]. Secondary metabolite production in a host plant can also be triggered by the existence of a parasite, as discussed in a study on *Tapirira guianensis* infested by *Phoradendron perrottetii*, in which infested branches produced more tannin compare to non-infested branches, with infestation inducing a systemic response [81].
Table 1. Ethnopharmacological database of epiphytic medicinal plants.

<table>
<thead>
<tr>
<th>No</th>
<th>Epiphyte species</th>
<th>Location</th>
<th>Part of plants</th>
<th>Preparation route and administration</th>
<th>Indication (traditional)</th>
<th>Pharmacological testing (modern)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Adiantum caudatum</em> L.</td>
<td>India, Indonesia, Malaysia</td>
<td>LF</td>
<td>Decoction</td>
<td>Cough, heal wound, cold, tumors of spleen, liver and other viscera, skin diseases, bronchitis, and inflammatory diseases [73,82,83]</td>
<td>Antimicrobial (MeOH extract, gram +, -, fungi) [73]</td>
</tr>
<tr>
<td>2</td>
<td><em>Asplenium nidus</em> L.</td>
<td>Tahiti, Malaysia, Philippines, Vanuatu, Indonesia</td>
<td>LF, WP</td>
<td>Ointment, decoction, eaten</td>
<td>Headache, hair loss (pounded leaves mixed with coconut oil), ease labor, fever (decoction), contraceptive, depurative, sedative agents. Edible food (young leaves), ornament, anti-inflammation, promote blood circulation [84–86]</td>
<td>Antioxidative (MeOH extract, DPPH), tyrosinase inhibiting (MeOH extract, microtitre), antibacterial (MeOH extract) [77]</td>
</tr>
<tr>
<td>3</td>
<td><em>Asplenium macrophyllum</em> Sw.</td>
<td>India</td>
<td>LF</td>
<td>Decoction</td>
<td>As laxative, emetic, diuretic, anthelmintic agent, to treat ophthalmia, jaundice, spleen diseases [85,87]</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><em>Asplenium polyodon</em> G. Foster var <em>bipinnatum</em> (Sledge)</td>
<td>India</td>
<td>LF</td>
<td>Decoction, paste</td>
<td>Promote labor, tumor [88]</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><em>Asplenium serratum</em> L.</td>
<td>Columbia, Peru na</td>
<td>Not mentioned</td>
<td></td>
<td>Liver problem, stomachache, ovary inflammation [85,89]</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><em>Stenochlaena palustris</em> (Burm. F.) Bedd.</td>
<td>Indonesia, India</td>
<td>LF, RZ</td>
<td>Eaten, decoction, poultice</td>
<td>Young reddish leaves are used as food, leaves are used to treat fever, skin diseases, throat, and gastric ulcer, as antibacterial, rhizome and leaves are used to treat burns and ulcers, as cooling agent [51,90]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><em>Davallia denticulata</em> (Burm. f.) Mett. ex Kuhn</td>
<td>Malaysia, Indonesia</td>
<td>RT</td>
<td>Decoction</td>
<td>Gout, pain, as tonic [82,91]</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Species</td>
<td>Origin</td>
<td>Part</td>
<td>Use</td>
<td>Additional Information</td>
<td></td>
</tr>
<tr>
<td>-----</td>
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<td></td>
</tr>
<tr>
<td>8</td>
<td><em>Araiostegia divaricata</em> (Blume) M. Kato</td>
<td>China, Taiwan WP</td>
<td>Not mentioned</td>
<td>Joint pain [92]</td>
<td>Anti-psoriasis [93], antioxidant (water extract, DPPH) [94]</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td><em>Davallia parvula</em> Wall. Ex Hook. &amp; Grev.</td>
<td>na Not mentioned</td>
<td>Not mentioned</td>
<td>Not mentioned [51,95]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td><em>Davallia solida</em> (G. Forst.) Sw.</td>
<td>Tahiti, Fiji, other Polynesian WP</td>
<td>Decoction (external and internal)</td>
<td>Dysmenorrhea, luochorea, uterine hemorrhage, sore throat, asthma, constipation, fracture, fish sting, promote health pregnancy, as a bath for newborn, anti-microbial [86,96–98]</td>
<td>Antioxidant (extract, ABTS) [94], antioxidant (DPPH, all isolates) [99], anti-neurotoxicity (extract, (Neuro-2a cells, ATCC CCL-131) [100], C-terminal cytosolic domain of P-pg [101], anti-skin aging [102]</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td><em>Leucostegia immersa</em> Wall. ex C. Presl Gesneriaceae</td>
<td>Nepal RZ Decoction, paste Boils (paste), constipation (decoction), as antibacterial (paste) [103]</td>
<td>Decoction paste</td>
<td>Boils (paste), constipation (decoction), as antibacterial (paste) [103]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td><em>Aeschynanthus radicans</em> Jack</td>
<td>Malaysia LF Decoction Headache [52]</td>
<td>Decoction</td>
<td>Headache [52]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td><em>Cyrtandra sp</em> Hymenophyllaceae</td>
<td>Indonesia LF Poultice Skin ailments [104]</td>
<td>Poultice</td>
<td>Headache [52]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td><em>Hymenophyllum polyanthos</em> Sw.</td>
<td>Suriname WP Burnt (smoke inhaling), decoction Dizziness (insanity), pain, cramps [105]</td>
<td>Burnt, decoction</td>
<td>Burnt (smoke inhaling), decoction Dizziness (insanity), pain, cramps [105]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td><em>Hymenophyllum javanicum</em> Spreng.</td>
<td>India WP Smoke together with garlic and onions Headache [88]</td>
<td>Smoke together with garlic and onions</td>
<td>Headache [88]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td><em>Huperzia carinata</em> (Desv. ex Poir.) Trevis Lycopodiaceae</td>
<td>South-East Asia WP Ointment Stimulate hair growth [106]</td>
<td>Ointment</td>
<td>Stimulate hair growth [106]</td>
<td>Anti-acetylcholinesterase (74,75,76, colorimetric Ellman method) [107]</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td><em>Nephrolepis acutifolia</em> (Desv.) Christ</td>
<td>Malaysia WP Boiled, eaten Food [112]</td>
<td>Boiled, eaten</td>
<td>Food [112]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Species</td>
<td>Distribution</td>
<td>Part/Method</td>
<td>Uses</td>
<td>Natural Products/Activities</td>
<td></td>
</tr>
<tr>
<td>-----</td>
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<td></td>
</tr>
<tr>
<td>21</td>
<td><em>Nephrolepis biserrata</em> (Sw.) Schott</td>
<td>Malaysia, Indonesia, Ivory Coast, New Guinea</td>
<td>LF, RZ, WP</td>
<td>Decoction, cooked Leaves are used to treat boils, blister, abscesses, sores, and cough. Rhizomes are used as edible food [113,114]</td>
<td>Antibacterial (extract) [115]</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td><em>Nephrolepis cordifolia</em> (L.) C. Presl</td>
<td>India</td>
<td>RZ</td>
<td>Decoction (fresh leaves) Cough, rheumatism, chest congestion, nose blockage, loss appetites, infection (antibacterial), pinnae is used to treat cough, wounds, jaundice, anti-fungal, styptic, anti-tussive [90]</td>
<td>Antibacterial, anti-fungal (extract fractions aerial part) [116]</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td><em>Oleandra musifolia</em> (Blume) C. Presl</td>
<td>Philippines, India</td>
<td>ST</td>
<td>Decoction Anthelmintic, emmenagogue, antidote (snake bite) [103,117]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td><em>Botrychum lanuginosum</em> illiciforme Wall.ex Hook &amp; Grev.</td>
<td>India</td>
<td>WP</td>
<td>Decoction, paste Antibacterial, anti-dysentery agents [90]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td><em>Ophioglossum pendulum</em> L.</td>
<td>Indonesia, Philippines</td>
<td>LF</td>
<td>Ointment, decoction. Hair treatment (crushed leaves), cough (decocotion), rid the first feces (spores), ornament [118]</td>
<td>Cell activator, skin whitening agent and antioxidant (patent, mixed with other Ophioglossum species) [119], anti-diarrhea (stipe MeOH extract, rabbit jejunum) [119]</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td><em>Pyrostis piloselloides</em> (L.) M.G. Price</td>
<td>Indonesia, Malaysia, China, Philippines, Pacific islands</td>
<td>LF</td>
<td>Decoction (internal), chewed, poultice (external) Smallpox, rashes, gonorrhea, dysentery, tuberculosis, urinary tract infection, headache, cough, gum inflammation, tooth sockets, eczema, coagulate blood [120–123]</td>
<td>Antibacterial, anti-fungal (extracts) [124]</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td><em>Drynaria rigidula</em> (Sw.) Bedd.</td>
<td>Indonesia, Philippines, Treasury Island</td>
<td>LF, RZ</td>
<td>Decoction, chewing Gonorrhea, dysentery (rhizome, decoction), and seasickness (chewed) [54]</td>
<td>n-Hexane, dichloromethane and ethyl acetate fractions from both rhizome and leaves of Drynaria rigidula were screened for activity against Plasmodium falciparum, Mycobacterium tuberculosis, vero cells and herpes simplex virus which all extracts showed insignificant activities [125]</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td><em>Drynaria sparsisora</em> (Desv.) T. Moore</td>
<td>Indonesia, Philippines, Thailand</td>
<td>LF, RZ</td>
<td>External, decoction Rhizome: headache, fever, diarrhea, gonorrhea, swollen limbs, fever. Leaves:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
29. **Drynaria roosii** Nakaie  
   China  
   WP  
   Decoction  
   anti-vomiting, snake bite, eye infection [54,104,126]  
   Deficient kidney, invigorate blood, heal wound, stop bleeding [54]

30. **Drynaria propinqua** (Wall. ex Mett.) Bedd  
   Bhutan, India and Nepal  
   ST  
   Pills  
   Antidote and detoxifier especially when suffering from meat poisoning and other human-made poisons (sbyar-dug) [128]

31. **Drynaria quercifolia** (L.) J.Sm.  
   Malaysia, Philippines, Indonesia, India  
   LF, RZ  
   Decoction, poultice  
   Swelling, fever (poultice leaves), haemoptysis, typhoid fever, ulcers, dyspepsia, arthralgia, diarrhea (decoced rhizome), inflammation, anthelmintic, cough, fever, phthisis, poultice of rhizome mixed with *Lannea coromandelica* (Houtt.) Merr. to treat headache, hepatoprotective agent [21, 22, 96]  
   Compound 200 from the ethyl acetate fraction to be responsible for good antimicrobial activity [129]

32. **Lepisorus contortus** (Christ) Ching  
   Bhutan, India, China  
   LF  
   Powder  
   Heals bone fracture, burns, wounds and kidney disorders [130]

33. **Loxogramme involuta** (D. Don) C. Presl  
   Indonesia  
   LF, WP  
   Smoked  
   Smoked with tobacco [51]

34. **Loxogramme scolopendria** (Bory) Presley  
   Indonesia  
   LF  
   Smoked  
   Cigarette paper [131]

35. **Microsorum fortunei** (T. Moore) Ching  
   Indonesia  
   WP  
   Decoction  
   Diuretic, promote blood circulation [82,84]

36. **Microsorum punctatum** (L.) Copel.  
   India  
   LF  
   Juice  
   Diuretic, purgative, wounds [103]

37. **Phlebodium aureum** (L.) J.Sm  
   Mexico  
   RZ  
   Decoction  
   Cough, fever, sudorific agents [90]

38. **Phymatosorus scolopendria** (Burm. f.) Pic. Serm.  
   South-East Asia, Madagascar  
   RZ  
   Fragrance (external), poultice, decoction  
   Bronchodilator (341, in vivo) [80]  
   Respiratory disorder [51,80]

39. **Platycerium coronarium** (Mull.) Desv.  
   Indonesia  
   LF  
   Poultice added (salt)  
   Thyroid edema, scabies [51,132]
<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Origins</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td><em>Platycerium bifurcatum</em> (Cav.) C. Chr.</td>
<td>Indonesia</td>
<td>Poultice (salt added) Thyroid edema, scabies, fever, swelling [100, 101]</td>
</tr>
<tr>
<td>41</td>
<td><em>Pleopeltis macrocarpa</em> (Bory ex Willd.) Kaulf.</td>
<td>South-Africa, Mexico, Guatemala</td>
<td>Decoction Sore throat, itches, cough, febrifuge [103, 133]</td>
</tr>
<tr>
<td>42</td>
<td><em>Pyrrosia heterophylla</em> (L.) M.G. Price</td>
<td>India</td>
<td>Poultice Swelling, sprain, pain (cooling agent) [134]</td>
</tr>
<tr>
<td>43</td>
<td><em>Pyrrosia lanceolata</em> (L.) Farw.</td>
<td>Malaysia, South-Africa, Mexico</td>
<td>Juice, poultice, decoction Dysentery, headache, colds, sore throats, itch guard [88, 120]</td>
</tr>
<tr>
<td>44</td>
<td><em>Pyrrosia lingua</em> (Thunb.) Farw.</td>
<td>Japan, China, Indonesia, Pacific Islands</td>
<td>Decoction Diuretic, anti-inflammation, analgesic, cough, stomachache, urinary disorder</td>
</tr>
<tr>
<td>45</td>
<td><em>Pyrrosia longifolia</em> (Burm. f.) C.V. Morton</td>
<td>Indonesia, Pacific Islands</td>
<td>Poultice (cold water) Ease pains in labor [51, 120]</td>
</tr>
<tr>
<td>46</td>
<td><em>Pyrrosia petiolosa</em> (Christ) Ching</td>
<td>China</td>
<td>Decoction Urinary tract infections, as diuretic [139]</td>
</tr>
<tr>
<td>47</td>
<td><em>Pyrrosia sheareri</em> (Baker) Ching</td>
<td>China</td>
<td>Decoction Bacillary dysentery, rheumatism [120, 140]</td>
</tr>
<tr>
<td></td>
<td><em>Psilotaceae</em></td>
<td></td>
<td>Antioxidant [140]</td>
</tr>
<tr>
<td>48</td>
<td><em>Psilotum nudum</em> (L.) P. Beauv.</td>
<td>India</td>
<td>Fresh, decoction Diarrhea (infants), antibacterial, purgative [88]</td>
</tr>
<tr>
<td></td>
<td><em>Pteridaceae</em></td>
<td></td>
<td>Anti-implantation (EtOH extract, albino rats) [141], Anti-tumour (hella cells, MTT assay)</td>
</tr>
<tr>
<td>49</td>
<td><em>Acrostichum aureum</em> L.</td>
<td>South-East Asia, Bangladesh, Fiji, China, Panama</td>
<td>Eaten, decoction Wounds, peptic ulcers and boils, worm infections, asthma, constipation, elephantiasis, febrifuge, chest pain, emollients [51, 68]</td>
</tr>
<tr>
<td></td>
<td><em>Selaginellaceae</em></td>
<td></td>
<td>Anti-cancer ((gastric: AGS; colon: HT-29 and breast: MDA-MB-435S) using the MTT assay) [144]</td>
</tr>
<tr>
<td>50</td>
<td><em>Acrostichum speciosum</em> Wild.</td>
<td>South-East Asia</td>
<td>Thatch [51]</td>
</tr>
<tr>
<td>51</td>
<td><em>Taenitis blechnoides</em> (Willd.) Sw.</td>
<td>Malaysia</td>
<td>Decoction Postnatal protection [145]</td>
</tr>
<tr>
<td>No.</td>
<td>Species</td>
<td>Origin</td>
<td>Part(s)</td>
</tr>
<tr>
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</tr>
<tr>
<td>52</td>
<td>Selaginella tamariscina (P.Beauv.) Spring</td>
<td>Nepal, WP, SP</td>
<td>Fresh (spore), decoction</td>
</tr>
<tr>
<td>53</td>
<td>Vittaria elongata Sw.</td>
<td>South-East Asia, Andaman</td>
<td>LF</td>
</tr>
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</tr>
<tr>
<td>54</td>
<td>Philodendron fragrantissinum (Hook.) G.Don</td>
<td>Guyana, Suriname, Brazil</td>
<td>LF, RT</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>56</td>
<td>Schefflera caudata (Vidal) Merr. &amp; Rolfe</td>
<td>Philippines, WP</td>
<td>Decoction</td>
</tr>
<tr>
<td>57</td>
<td>Schefflera elliptica (Blume) Harms.</td>
<td>South-East Asia, India</td>
<td>BK, LF, RT chewed, external</td>
</tr>
<tr>
<td>59</td>
<td>Schefflera elliptifoliola Merr. Philippines, Thailand</td>
<td>LF</td>
<td>Decoction</td>
</tr>
<tr>
<td>59</td>
<td>Schefflera oxypylla (Miq.) R.Vig.</td>
<td>Thailand, Malaysia, Indonesia</td>
<td>RT</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>60</td>
<td>Schefflera simulans Craib Thailand, Malaysia</td>
<td>LF, RT</td>
<td>Decoction</td>
</tr>
<tr>
<td>61</td>
<td>Asclepiadaceae sp.</td>
<td>Indonesia, Thailand</td>
<td>LF, RT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Dischidia acuminata Constantin Costantin</td>
<td>Vietnam, WP</td>
<td>Decoction</td>
</tr>
<tr>
<td>63</td>
<td>Dischidia bengalensis Colebr. Thailand, Malaysia</td>
<td>LT, RT</td>
<td>Latex (external), decoction (tonic)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Dischidia imbricata (Blume) Steud. Indonesia</td>
<td>LF</td>
<td>Poultice</td>
</tr>
<tr>
<td>65</td>
<td>Dischidia major (Vahl) Merr. India, Thailand, Philippines, Indonesia</td>
<td>LF, RT, WP</td>
<td>Decoction, chrused (external), Decoction, crhused (external), Decoction, crhused (external),</td>
</tr>
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<tr>
<td>Page</td>
<td>Species</td>
<td>Country</td>
<td>Part(s)</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------</td>
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<td>---------</td>
</tr>
<tr>
<td>66</td>
<td><em>Dischidia nummularia</em> R.Br.</td>
<td>Thailand, Indonesia</td>
<td>LF, LT, WP</td>
</tr>
<tr>
<td>67</td>
<td><em>Dischidia platyphylla</em> Schltr</td>
<td>Philippines</td>
<td>LF</td>
</tr>
<tr>
<td>68</td>
<td><em>Dischidia purpurea</em> Merr.</td>
<td>Philippines</td>
<td>LF</td>
</tr>
<tr>
<td>69</td>
<td><em>Toxocarpus sp.</em></td>
<td>Indonesia</td>
<td>LF</td>
</tr>
<tr>
<td>70</td>
<td><em>Impatiens niamniamensis</em> Gilg (semi epiphytic)</td>
<td>Congo</td>
<td>LF</td>
</tr>
<tr>
<td>71</td>
<td><em>Convolvulaceae</em> (parasite)</td>
<td>India, Taiwan, China, Vietnam, Malaysia, Philippines, Indonesia, Fiji, Africa, Central America</td>
<td>WP, NT</td>
</tr>
<tr>
<td>72</td>
<td><em>Cassytha filiformis</em> L</td>
<td>Indonesia, Vietnam, China</td>
<td>WP, SD</td>
</tr>
<tr>
<td>73</td>
<td><em>Cuscuta australis</em> R.Br.</td>
<td>Indonesia, Vietnam, China</td>
<td>WP, SD</td>
</tr>
</tbody>
</table>
hair growth activity in androgen-induced alopecia [173], anti-inflammatory (murine macrophage cell line RAW264.7), anti-cancer (Hep3B cells by MTT assay) [174], antioxidant (EtOAc extract, DPPH), anti-obesity (EtOAc extract) [175]

<p>| Clusiaceae | 75 | Clusia grandiflora | Splitg. (hemi epiphyte) | Guyana, Suriname | RT | Decoction | Aphrodisiac [105] | Antibacterial [176] |
| Clusia fockeana | Miq. (hemi epiphyte) | Guyana, Suriname | ST(Exudate) | Poultice | Snake bites, ulcers [105] |
| Gesneriaceae | 77 | Columnea nicaraguensis | Oerst. | Panama | ST, LF, WP | Decoction, maceration | Fever [177] |
| Columnea sanguinolenta | Klotzsch ex Oerst. | Panama | ST, LF | Decoction | Dysmenorrhea [177] |
| Columnea tulae Urb. var. tomentulosa | (C.V. Morton) | Panama | ST | Decoction | Fever [177] |
| Drymonia serrulata | (Jacq.) Mart. | Amazon | na | Not mentioned | Eczema [178] |
| Drymonia coriacea | (Oerst. ex Hanst.) Wiehler | Amazon | na | Not mentioned | Toothache [178] |
| Loganiaceae | 82 | Fagraea auriculata | Jack. | Indonesia | ST | Stem for stick [58] | Anti-inflammatory [180] |
| Loranthaceae (parasite) | 83 | Amyema bifurcata | Benth. | Australia | ST, LF | Decoction | Colds, fever, sores [181] |
| Amyema quandang | (Lindl.) Tegh. | Australia | LF | Decoction | Fever [182] |
| Amyema maidenii | (Blakely) Barlow | Australia | FT | Decoction | Inflammation in the genital regions [183] |
| Dendrophthoe falcata | (L.f.) Ettingsh | India | WP | Decoction | Pulmonary tuberculosis, asthma, menstrual disorders, swellings, wounds, ulcers, strangury, renal and vesical calculi, Wound healing activity was studied, antimicrobial activity and antioxidant activity [185] |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Location</th>
<th>Part Used</th>
<th>Uses</th>
<th>Additional Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>87</td>
<td>Dendrophthoe frutescens L.</td>
<td>Indonesia</td>
<td>LF, WP</td>
<td>Drink (decoction)</td>
<td>anti-inflammation, antibacterial [84]</td>
</tr>
<tr>
<td>88</td>
<td>Dendrophthoe incarnata (Jack) Miq.</td>
<td>Malaysia</td>
<td>LF</td>
<td>Poultice</td>
<td>Mixed with Curcuma longa L. and rice to make poultice to treat ringworm [186]</td>
</tr>
<tr>
<td>89</td>
<td>Dendrophthoe pentandra (L.) Miq.</td>
<td>Indonesia, Malaysia, Thailand,</td>
<td>LF, WP</td>
<td>Poultice, decoction</td>
<td>Sores, ulcers, other skin infections, protective medicine after childbirth, cough, hypertension, cancer, diabetes, tonsil problem [51,58,186,187]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vietnam</td>
<td></td>
<td></td>
<td>Antioxidant (MeOH extract, DPPH), Tyrosinase activity [187]</td>
</tr>
<tr>
<td>90</td>
<td>Taxillus umbellifer (Schult. f.) Danser</td>
<td>Indonesia, Malaysia, Vietnam</td>
<td>RT, LF</td>
<td>Decoction, drink, poultice</td>
<td>Fever, headache, wounds [186]</td>
</tr>
<tr>
<td>91</td>
<td>Erianthenum dregii (Eckl. &amp; Zeyh.) Tiegh.</td>
<td>Southern &amp; Eastern Africa</td>
<td>BK</td>
<td>Mixed with milk</td>
<td>Powdered mixed with milk to treat stomach problems in children [188]</td>
</tr>
<tr>
<td>92</td>
<td>Loranthus globosus Roxb</td>
<td>Malaysia, Indo-China</td>
<td>LF, ST, FT, juice</td>
<td>Poultice (leaves), juice</td>
<td>Headache, expel afterbirth, cough [189]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WP</td>
<td>Poultice, decoction</td>
<td>Antimicrobial, cytotoxicity (brine shrimp) [190], toxicity (Evan’s rat) [191]</td>
</tr>
<tr>
<td>93</td>
<td>Loranthus spec div.</td>
<td>Indonesia</td>
<td>LF, ST, FT, juice</td>
<td>Poultice (leaves), juice</td>
<td>Antimicrobial, cytotoxicity (brine shrimp) [190], toxicity (Evan’s rat) [191]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WP</td>
<td>Poultice, decoction</td>
<td>Antimicrobial, cytotoxicity (brine shrimp) [190], toxicity (Evan’s rat) [191]</td>
</tr>
<tr>
<td>94</td>
<td>Macrosolen robinsonii (Gamble) Danser</td>
<td>Vietnam</td>
<td>LF</td>
<td>Decoction</td>
<td>Enlarged abdomen (diuretic tea) [192]</td>
</tr>
<tr>
<td>95</td>
<td>Macrosolen cochinensis (Lour.) Tiegh.</td>
<td>Malaysia, Indo-China</td>
<td>ST, LF</td>
<td>Decoction, juice, poultice</td>
<td>Expel after birth, headache, cough [192]</td>
</tr>
<tr>
<td>96</td>
<td>Scurrula atropurpurea (Blume) Danser</td>
<td>Indonesia, Philippines</td>
<td>LF, ST, WP</td>
<td>Decoction, poultice</td>
<td>Mouthwash (gargled), cancer (breast, throat cancer), cowpox, chickenpox, diarrhea, hookworm, measles, hepatitis, and cancer [193–195]</td>
</tr>
<tr>
<td>97</td>
<td>Scurrula ferruginea (Jack) Danser</td>
<td>Malaysia</td>
<td>LF, WP</td>
<td>Decoction, poultice</td>
<td>Decoction whole plant (mixed with Millettia sericea (Vent.) Wight &amp; Arnott) is used as bathing to relieve malaria, decocted leaves as protective medicine after childbirth, pounded leaves to treat wounds, snake bites [193]</td>
</tr>
</tbody>
</table>
| 98  | Scurrula parasitica L.                      | China, Vietnam                  | WP                    | Decoction                                                                                     | Anti-cancer (flavonoids extract, Leukimia cell line HL-60) [199], NF-κB inhibition [199], recovery of cisplatin-induced nephrotoxicity [200], Antioxidant (extracts, DPPH) [201] anti-
cancer (Polysaccharide fraction, S180, K562 and HL-60 cell lines, MTT assay) [202], anti-obesity activity using porcine pancreatic lipase assay (EtOH extract, PPL; triacylglycerol lipase, EC 3.1.1.3)[203], neuroprotective activity (168, H2O2-induced oxidative damage in NG108-15 cells)[204], antibacterial (EtOH extract, MRSA) [205]

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Location</th>
<th>Part(s)</th>
<th>Uses</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td><em>Viscum aethiopicum</em> [sic]</td>
<td>Southern &amp; Eastern Africa</td>
<td>LF</td>
<td>Decoction (tea)</td>
<td>Diarrhea [188]</td>
</tr>
<tr>
<td>100</td>
<td><em>Viscum capense</em> L.f.</td>
<td>Southern &amp; Eastern Africa</td>
<td>ST, FT</td>
<td>Decoction, external</td>
<td>Wart, asthma, irregular menstruation, hemorrhage [188]</td>
</tr>
<tr>
<td>101</td>
<td><em>Viscum pauciflorum</em> L.f.</td>
<td>Southern &amp; Eastern Africa</td>
<td>WP</td>
<td>Decoction</td>
<td>Astringent [188]</td>
</tr>
<tr>
<td>102</td>
<td><em>Viscum rotundifolium</em> L.f.</td>
<td>Southern &amp; Eastern Africa</td>
<td>WP</td>
<td>External</td>
<td>Wart [188]</td>
</tr>
<tr>
<td>103</td>
<td><em>Melastomataceae</em></td>
<td></td>
<td>LF, RT</td>
<td>Leaves eaten to treat dysentery, adventitious roots applied as poultice to wound, young leaves to skin disorders</td>
<td>Dysentery, wound and skin disorders [153]</td>
</tr>
<tr>
<td>104</td>
<td><em>Medinilla radicans</em> Blume</td>
<td>Indonesia</td>
<td>TB</td>
<td>Decoction</td>
<td>Hemorrhoids [51,104]</td>
</tr>
<tr>
<td>105</td>
<td><em>Ficus annulata</em> Blume</td>
<td>Indonesia</td>
<td>LF, RT</td>
<td>Leaves decoction to treat fever, the root to treat Hansen diseases</td>
<td>Fever and Hansen diseases [195]</td>
</tr>
<tr>
<td>106</td>
<td><em>Ficus deltoidea</em> Jack</td>
<td>Indonesia, Malaysia, Thailand</td>
<td>LF, RT, FT</td>
<td>Drink (decoction), ointment</td>
<td>Leucorrhea, headache, fever, diabetes, high blood pressure, skin infection, aphrodisiac agent, ornament [104,208–210]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Toxicity (aqueous extract, rats) [211], anti-nociceptive [212], antioxidant (leaves aqueous extracts, redn. power of iron (III), superoxide anion (O2-)</td>
</tr>
</tbody>
</table>

Antimicrobial activity (stems extract), Anticonvulsant activity (MeOH extract, albino mice) [206]
<table>
<thead>
<tr>
<th>Entry</th>
<th>Species</th>
<th>Country</th>
<th>Part</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>107</td>
<td><em>Ficus lacor</em> Buch.-Ham.</td>
<td>India</td>
<td>BK, LT, BD, SD</td>
<td>Decoction, poultice</td>
</tr>
<tr>
<td>108</td>
<td><em>Ficus natalensis</em> Hochst. (semi epiphytic, secondary terrestrial)</td>
<td>Uganda, Tanzania, Senegal, West Africa, South Africa</td>
<td>LF, LT, RT, BK</td>
<td>Decoction, poultice</td>
</tr>
<tr>
<td>109</td>
<td><em>Ficus parietalis</em> Blume</td>
<td>Vietnam, Thailand, Malaysia, Indonesia</td>
<td>RT</td>
<td>Decoction</td>
</tr>
<tr>
<td>110</td>
<td><em>Ficus pumila</em> L.</td>
<td>Vietnam</td>
<td>FT, LF, LT</td>
<td>Drink (decoction)</td>
</tr>
<tr>
<td>111</td>
<td><em>Poikilospermum suaveolens</em> (Blume) Merr.</td>
<td>Indonesia, Thailand</td>
<td>BK</td>
<td>Decoction</td>
</tr>
<tr>
<td><strong>Orchidaceae</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>112</td>
<td><em>Acampe carinata</em> (Griff.) Panigrahi</td>
<td>Himalaya, Nepal</td>
<td>WP</td>
<td>Decoction</td>
</tr>
<tr>
<td>Page</td>
<td>Species</td>
<td>Country</td>
<td>Application</td>
<td>Additional Information</td>
</tr>
<tr>
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</tr>
<tr>
<td>113</td>
<td>Acriopsis liliifolia (J.Koenig) Seidenf.</td>
<td>Malaysia</td>
<td>Decoction of the roots and leaves</td>
<td>Fever [229]</td>
</tr>
<tr>
<td>114</td>
<td>Anoectochilus formosanus Hayata</td>
<td>Taiwan</td>
<td>Decoction</td>
<td>Fever, anti-inflammatory agent, diabetes, liver disorder, chest and abdominal pain [230]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anti-inflammatory (water extract, rat paw), hepatoprotective (water extract, rat, SGOT-OPT) [231], anti-hyperlipidosis (414, rat induced) [232], ameliorative effect (water extract, ovariectomised rat) [233], antioxidant (water extract, DPPH) [234], anti-hyperglycemic (water extract, diabetic rats induced by streptozotocin) [235], anti-cancer (extracts, breast cancer MCF-7 cell) [236], liver regeneration (extract, rat) [237,238], Hepatoprotective (414, CCl(_4) induced rat) anti-inflammatory (414, lps stimulate mice) [239,240], anti-cancer (polysaccharide water extract, prostate cancer cell line PC3) [241]</td>
</tr>
<tr>
<td>115</td>
<td>Anoectochilus roxburghii (Wall.) Lindl.</td>
<td>Taiwan, China, Japan</td>
<td>Decoction</td>
<td>Fever, snake bite, lung and liver diseases, hypertension, child malnutrition [242]</td>
</tr>
<tr>
<td>116</td>
<td>Ansellia africana Lindl.</td>
<td>Southern &amp; Eastern Africa</td>
<td>Decoction</td>
<td>Pedi is used to treat cough, the stem is used as aphrodisiac, used as emetic agent [188]</td>
</tr>
<tr>
<td>117</td>
<td>Bulbophyllum kwangtungense Schltr.</td>
<td>China, Japan</td>
<td>TB</td>
<td>Tonic</td>
</tr>
<tr>
<td>118</td>
<td>Bulbophyllum odoratissimum (Sm.) Lindl. ex Wall.</td>
<td>China, Burma, Vietnam, Thailand, Laos, Nepal, Bhutan, India</td>
<td>Decoction</td>
<td>To treat pulmonary tuberculosis, chronic inflammation and fracture [247]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anti-tumor activities (456, 457, 458, against HeLa and K562 human tumor cell line) [246]</td>
</tr>
</tbody>
</table>
|      |                              |        |             | Anti-tumor (bibenzyl, inhibiting NO microphage) [247,248], anti-cancer (225,470, 471, 475, 476, 478, 479, 482, 484, human leukaemia cell lines K562 and HL-60, human lung adenocarcinoma A549, human hepatoma BEL-7402 and human stomach cancer SGC-790) [249], anti-cancer (human leukemia cell lines K562 and HL-60, human lung...
<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Origin</th>
<th>Part</th>
<th>Use</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>119</td>
<td>Bulbophyllum vaginatum</td>
<td>Malaysia</td>
<td>WP</td>
<td>Juice</td>
<td>Juice of the plant is instilled in the ear to cure earache [160]</td>
</tr>
<tr>
<td></td>
<td>(Lindl.) Rchb.f.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Catasetum barbatum</td>
<td>Japan, Guiana,</td>
<td>WP</td>
<td>Decoction</td>
<td>Febrifuge, anti-inflammatory [79]</td>
</tr>
<tr>
<td></td>
<td>(Lindl.) Lindl.</td>
<td>Paraguayan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>121</td>
<td>Coelogyne sp</td>
<td>Indonesia</td>
<td>RT</td>
<td>Decoction</td>
<td>Headache, fever [104]</td>
</tr>
<tr>
<td>122</td>
<td>Cymbidium aloifolium</td>
<td>Thailand, Vietnam</td>
<td>LF, RT</td>
<td>Decoction</td>
<td>Otitis media, colds, irregular periods, arthritis, sores, burns, tonic [252]</td>
</tr>
<tr>
<td></td>
<td>(L.) Sw.</td>
<td></td>
<td>Decoction (internal), juice from heated or crushed leaves.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>Cymbidium canaliculatum</td>
<td>Australia</td>
<td>PdB</td>
<td>Chewed, poultice</td>
<td>Dysentery, boils, sores, wounds, itchy skin, fractured arms over the break [181, 254]</td>
</tr>
<tr>
<td></td>
<td>R.Br</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>124</td>
<td>Cymbidium ensifolium</td>
<td>Taiwan, Vietnam</td>
<td>LF, RT, FL, WP,</td>
<td>Decoction</td>
<td>Diuretic agent (leaves), pectoral agent (root), eye problem (flower), cough, lung, gastrointestinal problems and sedative [252]</td>
</tr>
<tr>
<td></td>
<td>(L.) Sw.</td>
<td></td>
<td>RT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>Cymbidium goeringii</td>
<td>Japan, China, Korea,</td>
<td>WP</td>
<td>Decoction</td>
<td>Hypertension, diuretic agent [255]</td>
</tr>
<tr>
<td></td>
<td>(Rchb.f.) Rchb.f.</td>
<td>Thailand, Vietnam,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vietnam, India</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>126</td>
<td>Cymbidium madidum</td>
<td>Australia</td>
<td>PdB</td>
<td>Chewed</td>
<td>Dysentery [181]</td>
</tr>
<tr>
<td></td>
<td>Lindl.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>127</td>
<td>Dendrobium affine</td>
<td>Australia</td>
<td>PdB</td>
<td>Poultice, external</td>
<td>Chushed pseudobulbs (sticky) is applied to itchy skins, boils, infected skin lesion, minor burns [181]</td>
</tr>
<tr>
<td></td>
<td>(Decne.) Steud.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>128</td>
<td>Dendrobium aloifolium</td>
<td>South East Asia</td>
<td>LF</td>
<td>Poultice</td>
<td>Headache [51]</td>
</tr>
<tr>
<td></td>
<td>(Blume) Rchb.f.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>129</td>
<td>Dendrobium amoenum</td>
<td>China</td>
<td>LF</td>
<td>Dried and ground</td>
<td>Skin diseases [257]</td>
</tr>
<tr>
<td></td>
<td>Wall. ex Lindl.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>Dendrobium chryseum Rofe</td>
<td>Australia</td>
<td>LF</td>
<td>Decoction</td>
<td>Diabetes [258]</td>
</tr>
</tbody>
</table>

Notable: Anti-cancer (473 and 474, human leukemia cell lines K562 and HL-60, human lung adenocarcinoma A549, human hepatoma BEL-7402 and human stomach cancer cell lines SGC-7901) [250]
<table>
<thead>
<tr>
<th>ID</th>
<th>Species</th>
<th>Origin</th>
<th>Part Used</th>
<th>Preparation</th>
<th>Use(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>131</td>
<td><em>Dendrobium candidum</em></td>
<td>China</td>
<td>LF</td>
<td>Decoction</td>
<td>Diabetes [260]</td>
</tr>
<tr>
<td></td>
<td>Wall. ex Lindl.</td>
<td></td>
<td></td>
<td></td>
<td>Inhibitory effect of atropine on salivary secretion (extracts, rabbit) [261], anti-hyperglycemic (extract, streptozotocin-induced diabetic (STZ-DM) rats) [260], antioxidant (polysaccharide, 10-phenanthroline-Fe²⁺-H₂O₂ systems and ammonium peroxydisulfate/N,N,N',N'-tetra-methylethanediamine systems) [262] antioxidant (555, 556, DPPH) [263], antioxidant (558, 559, 560, DPPH) [264], anti-tumor (soluble polysaccharide, human neuroblastoma (SH2SY5Y) induced by SDP was observed and analyzed by Hoechst stain method) [265]</td>
</tr>
<tr>
<td>132</td>
<td><em>Dendrobium canaliculatum</em></td>
<td>Australia</td>
<td>PdB</td>
<td>Poultice, external</td>
<td>Chrused pseudobulbs (sticky) is applied to infected skin and cuts [181]</td>
</tr>
<tr>
<td></td>
<td>var. foelschei (F.Muell.)</td>
<td></td>
<td></td>
<td></td>
<td>Antimicrobial [268]</td>
</tr>
<tr>
<td></td>
<td>Rupp &amp; T.E.Hunt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>133</td>
<td><em>Dendrobium crumenatum</em></td>
<td>Malaysia,</td>
<td>LF,</td>
<td>Leaves pounded,</td>
<td>Acne (leaves), infected ears (pseudotubers) [266,267]</td>
</tr>
<tr>
<td></td>
<td>Sw.</td>
<td>Indonesia</td>
<td>PdTB</td>
<td>bulbs heated to</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>produce juice and</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>applied as external</td>
<td></td>
</tr>
<tr>
<td>134</td>
<td><em>Dendrobium chrysanthum</em></td>
<td>China</td>
<td>LF</td>
<td>Dried and ground</td>
<td>Skin diseases, immune regulator, anti-pyretic, improve eyesight [269,268]</td>
</tr>
<tr>
<td></td>
<td>Wall. ex Lindl.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>135</td>
<td><em>Dendrobium densiflorum</em></td>
<td>China</td>
<td>LF</td>
<td>Tonic</td>
<td>Promote body fluid production [270]</td>
</tr>
<tr>
<td></td>
<td>Lindl.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>136</td>
<td><em>Dendrobium faciferum</em></td>
<td>Indonesia</td>
<td>ST</td>
<td>Dried</td>
<td>For twist work (craft) [271]</td>
</tr>
<tr>
<td></td>
<td>J.J.Sm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>137</td>
<td><em>Dendrobium fimbriatum</em></td>
<td>Japan,</td>
<td>LF</td>
<td>Decoction, paste</td>
<td>Promote body fluid production, set fractured bone (paste) [272]</td>
</tr>
<tr>
<td></td>
<td>Hook.</td>
<td>China</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>138</td>
<td><em>Dendrobium loddigesii</em></td>
<td>China</td>
<td>LF</td>
<td>Decoction</td>
<td>Promote body fluid production, reduce fever, nourish the stomach, anti-cancer agent [274]</td>
</tr>
<tr>
<td></td>
<td>Rolfe</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Antioxidant (water-soluble crude polysaccharide (DFHP), DPPH) [273] Inhibitors of Na⁺, K⁺-ATPase of rat kidney (607, 608) [275], antiplatelet aggregation activity (479, 523, 606, rabbit platelet) [276], antioxidant (DPPH), anti NO production (activated...
<table>
<thead>
<tr>
<th>Page</th>
<th>Species</th>
<th>Origin</th>
<th>Part</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>139</td>
<td><em>Dendrobium moniliforme</em> (L.) Sw.</td>
<td>China, Taiwan</td>
<td>Decoction dried stem</td>
<td>Anti-pyretic, analgesic, aphrodisiac, stomachic, tonic agents [278]</td>
</tr>
<tr>
<td>140</td>
<td><em>Dendrobium moschatum</em> (Buch.-Ham) S.w</td>
<td>Nepal</td>
<td>Juice</td>
<td>Cure earache [282]</td>
</tr>
<tr>
<td>141</td>
<td><em>Dendrobium nobile</em> Lindl.</td>
<td>China, Indonesia</td>
<td>Tonic</td>
<td>Fever, reduce mouth dryness, aphrodisiac, promote body fluid production, nourish stomach, anorexia, lumbago, impotence [266,283–286]</td>
</tr>
<tr>
<td>142</td>
<td><em>Dendrobium pachyphyllum</em> (Kuntze) Bakh.f.</td>
<td>Indonesia</td>
<td>Decoction</td>
<td>Hydropsy [271]</td>
</tr>
<tr>
<td>143</td>
<td><em>Dendrobium purpureum</em> Roxb.</td>
<td>Indonesia, Malaysia</td>
<td>Crushed and heated to make poultice</td>
<td>Nail fungal infection [266]</td>
</tr>
<tr>
<td>144</td>
<td><em>Dendrobium salaccense</em> (Blume) Lindl.</td>
<td>Indonesia</td>
<td>Decoction</td>
<td>Severe headache, other pains [294,295]</td>
</tr>
<tr>
<td>145</td>
<td><em>Dendrobium teretifolium</em> R.Br.</td>
<td>South-Pacific Island</td>
<td>Dried</td>
<td>Anxiety and panic [296]</td>
</tr>
<tr>
<td>146</td>
<td><em>Dendrobium catenatum</em> Lindl.</td>
<td>China</td>
<td>Decoction</td>
<td>Twist work [271]</td>
</tr>
<tr>
<td>147</td>
<td><em>Dendrobium utile</em> J.J.Sm.</td>
<td>Indonesia</td>
<td>Dried</td>
<td>Twist work [271]</td>
</tr>
</tbody>
</table>

Macrophages-like cell line, RAW264.7) [277] Anti-inflammatory (552, RAW 264.7 cells) [279], hypoglycemic (polysaccharide, mice) [280], antioxidant (polysaccharide) [281]. Immunomodulatory activity (656, 660, 661, 662, 663, lymphocyte proliferation test MTT test) [287,288], antioxidant (478, 523, 524, 528, 584, 641, 672, 673, 674, DPPH) anti-NO (478, 523, 524, 528, 584, 641, 672, 673, 674, murine macrophage-like cell line RAW 264.7) [289], antioxidant (water-soluble polysaccharide (DNP), DPPH) [290], antimicrobial (Extracts), antitumour (extracts, Dalton’s lymphoma ascites (DLA) cells w), induction of in vitro lipid peroxidation (extracts, TBARS) [291], NO inhibition (475, 523, 542, 632, 633, 634, 665–671, murine macrophage RAW 264.7 cells) [292], anti-tumor (polysaccharide extracts, sarcoma 180 in vivo and HL-60)[293]
<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Country/Region</th>
<th>Part(s)</th>
<th>Preparation</th>
<th>Use(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>148</td>
<td><em>Dichaea muricata</em> (Sw.) Lindl.</td>
<td>Central, South American</td>
<td>LF</td>
<td>Decoction (wash)</td>
<td>Eye infection [285]</td>
</tr>
<tr>
<td>149</td>
<td><em>Eulophia speciosa</em> (R.Br.) Boltus</td>
<td>Indonesia</td>
<td>RT</td>
<td>Decoction</td>
<td>Analgesic [271]</td>
</tr>
<tr>
<td>150</td>
<td><em>Epidendrum strobiliferum</em> Rchb.f.</td>
<td>China, Korea</td>
<td>ST</td>
<td>Infusion, decoction</td>
<td>Analgesic [297]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Analgesic (676, 677) exhibited notable analgesic action at 3 mg/kg, causing 86 and 83% inhibition of abdominal constriction, respectively [297], antinociceptive effect (MeOH extract, methanolic ext. (ME) [298]</td>
</tr>
<tr>
<td>151</td>
<td><em>Epidendrum rigidum</em> Jacq.</td>
<td>Mexico, North America, South America, Antilles</td>
<td>ST</td>
<td>Infusion, decoction</td>
<td>Replenish body fluid [299]</td>
</tr>
<tr>
<td>152</td>
<td><em>Mycaranthes pannea</em> (Lindl.) S.C.Chen &amp; J.J.Wood</td>
<td>Vietnam, Madagascar</td>
<td>WP</td>
<td>External, medicinal bath</td>
<td>Medicial bath to treat ague and malaria fever, fractures, bruises, skin complaints, dislocated joint to relieve severe pain, swelling, dislocation and fracture [153,300,301]</td>
</tr>
<tr>
<td>153</td>
<td><em>Eriopsis biloba</em> Lindl.</td>
<td>America</td>
<td>ST</td>
<td>Poultice</td>
<td>Sore gums and mouth membranes [285]</td>
</tr>
<tr>
<td>154</td>
<td><em>Grammatophyllum scriptum</em> (L.) Blume</td>
<td>Indonesia, Thailand</td>
<td>BL, SD, ST</td>
<td>Poultice</td>
<td>Pseudo bulb mixed with curcuma and salt applied to sores and abdomen to expel worms, to treat dropsy and aphthae, seeds mixed with food to treat dysentery, aphthae, crushed plant mixed with rice liquor to treat snake bite, scorpions’ and centipedes’ stings [271,302]</td>
</tr>
<tr>
<td>155</td>
<td><em>Jumellea fragrans</em> (Thouars) Schltr.</td>
<td>Madagascar</td>
<td>LF, ST</td>
<td>Decoction</td>
<td>Anti-spasmodic, anti-asthmatic agents, mixed leaves of <em>Ziziphus mauritiana, Mussaenda arcurate</em> to treat eczema (deecotion), mixed with <em>Eugenia uniflora</em> to treat diarrhea [57]</td>
</tr>
<tr>
<td>156</td>
<td><em>Liparis condylobulbon</em> Rchb.f.</td>
<td>Indonesia</td>
<td>PdB, LF</td>
<td>Chewing, external</td>
<td>Intestinal complaints and constipation. (eastern Sulawesi, ambon), tormina, abscess [271,303]</td>
</tr>
<tr>
<td>157</td>
<td><em>Liparis nervosa</em> (Thunb.) Lindl.</td>
<td>China, Thailand, Malaysia</td>
<td>WP</td>
<td>Decoction, external</td>
<td>Stop internal/external bleeding, treat snake bites [303]</td>
</tr>
</tbody>
</table>

*Notes:*
- LF: Leaf
- RT: Root
- ST: Stem
- PdB: Pods
- WP: Whole plant
- BL: Bulb
- SD: Seed
- ME: Methanolic ext.

158 Neottia ovata (L.) Bluff & Fingerh. Spain TB Tincture Stomach diseases [304]
159 Masdevallia uniflora Ruiz & Pav. Mexico, south America WP Decoction Facilitate urination (pregnant women), reduce bladder inflammation [285]
160 Camaridium densum (Lindl.) M.A.Blanco Mexico WP Decoction Analgesic, relaxant agents [306]
161 Neottia boothii (Lindl.) Schltr. Malaysia WP Decoction Relaxant agent [307]
162 Oberonia lycopodioides (J.Koenig) Ormerod Malaysia LF Poultice Boils [153,308]
163 Oberonia mucronata (D.Don) Ormerod & Seidenf. China, Vietnam WP Decoction Rheumatism, promote blood circulation, bruises and fractures, detoxicant, diuretic agent [309]
164 Erycina pusilla (L.) N.H.Williams & M.W.Chase Mali WP Decoction Lacerations [285]
165 Otochilus lancilabius Seidenf. Bhutan, Nepal, India, China (Tibet), Laos and Vietnam WP Pills Antiemetic, febrifuge for stomach inflammation (bad-tshed), and allays hyperdipsia and dehydration [56]
166 Phragmipedium pearcei (Rchb.f.) Rauh & Senghas South America WP Decoction Stomachache [285]
167 Pholidota articulata Lindl. Himalaya, Nepal WP Whole plant: bone fractures [228]
168 Pholidota chinensis Lindl. China, India PdB Tincture Scrofula, toothache, stomachache, chronic bronchitis, duodenal ulcer [310]
<table>
<thead>
<tr>
<th>Page</th>
<th>Plant Name</th>
<th>Country/Region</th>
<th>Part(s)</th>
<th>Activity/Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>169</td>
<td>Renanthera moluccana</td>
<td>Indonesia</td>
<td>WP</td>
<td>Ornament [271]</td>
</tr>
<tr>
<td>170</td>
<td>Rhynchostylis retusa (L.) Blume</td>
<td>Himalaya, Nepal, India</td>
<td>LF</td>
<td>Rheumatic, hepato-protective agent [312,228]</td>
</tr>
<tr>
<td>171</td>
<td>Scaphyglottis livida (Lindl.) Schltr.</td>
<td>Mexico</td>
<td>WP</td>
<td>Decoction, Analgesic, anti-inflammatory agents [306,313]</td>
</tr>
<tr>
<td>172</td>
<td>Vanda tessellata (Roxb.) Hook. ex G.Don</td>
<td>India, Sri Lanka, Burma</td>
<td>LF, RT, FL</td>
<td>Fever (as paste), otitis (dropped juice), the root to treat bronchitis, rheumatic, dyspepsia, sciatica, inflammation, otitis, nervous problem, fever and as aphrodisiac, laxative, tonic (for liver) agent [140,289-291]</td>
</tr>
<tr>
<td>173</td>
<td>Papilomanthe teres (Roxb.) Schltr.</td>
<td>Indonesia</td>
<td>WP</td>
<td>Ornamental [318]</td>
</tr>
<tr>
<td>174</td>
<td>Vanilla griffithii Rchb.f.</td>
<td>Indonesia</td>
<td>WP</td>
<td>Edible [318]</td>
</tr>
<tr>
<td>175</td>
<td>Vanilla planifolia Jacks. ex Andrews</td>
<td>Mexico</td>
<td>FT, STh</td>
<td>Fever, rheumatism, hysteria, increase energy and muscular system [58,284,318]</td>
</tr>
<tr>
<td>176</td>
<td>Peperomia galioides Kunth</td>
<td>Peru</td>
<td>WP</td>
<td>Poultice (external), drink (internal) Chrused plant is used to treat wounds, cuts, plant juice is used to treat gastric ulcers [321]</td>
</tr>
<tr>
<td>177</td>
<td>Piper retrofractum Vahl</td>
<td>Indonesia</td>
<td>FT, RT</td>
<td>Drink (decoction) Anticonvulsion, antivomiting, diarrhea, dysentery, constipation, headache [324]</td>
</tr>
<tr>
<td>178</td>
<td>Hydnophytum formicarum Jack</td>
<td>Indonesia, Philippines, Thailand</td>
<td>TB</td>
<td>Poultice, decoction, powder Poultice to treat swelling, headache, decoction to treat liver, intestinal complaints, powder as anthelmintic, heart activated macrophages-like cell line, RAW 264.7) [310]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Additional Notes:**
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<table>
<thead>
<tr>
<th>Page</th>
<th>Myrmecodia tuberosa Jack</th>
<th>Indonesia</th>
<th>PT</th>
<th>Drink (decocted)</th>
<th>Swelling, headache [51,104,338]</th>
</tr>
</thead>
<tbody>
<tr>
<td>179</td>
<td>Myrmecodia pends Merr. &amp; L.M.Perry</td>
<td>Papua</td>
<td>PT</td>
<td>Decoction</td>
<td>Rheumatism, headache, renal problems, tumor [340]</td>
</tr>
<tr>
<td>180</td>
<td>Scaphium macropodum (Miq.) Beumée ex K.Heyne (hemi-epiphyte)</td>
<td>Indonesia</td>
<td>RT</td>
<td>Drink (decoction)</td>
<td>Nervous system problem [104]</td>
</tr>
<tr>
<td>181</td>
<td>Premna parasitica Blume</td>
<td>Indonesia</td>
<td>LF</td>
<td>Drink (decoction)</td>
<td>Fever [58]</td>
</tr>
<tr>
<td>182</td>
<td>Viscum articulatum Burm.f.</td>
<td>Cambodia, India, Taiwan, China</td>
<td>WP</td>
<td>Poultice, decoction</td>
<td>Decoction to treat bronchitis, skin tumour, neuralgia, arthritis and as tonic, sedative, febrifuge, crushed plant to treat cut [341]</td>
</tr>
<tr>
<td>183</td>
<td>Viscum articulatum Burm.f.</td>
<td>Cambodia, India, Taiwan, China</td>
<td>WP</td>
<td>Poultice, decoction</td>
<td>Decoction to treat bronchitis, skin tumour, neuralgia, arthritis and as tonic, sedative, febrifuge, crushed plant to treat cut [341]</td>
</tr>
</tbody>
</table>

Tonic, antidiabetic agent and to treat skin, bone, knee, ankle, lung diseases [303], extract, assayed spectrophotometrically under aerobic conditions [334], antimicrobial, cytotoxicity (226, 786, 787, against HuCCA-1 and KB cell lines) [335], trigger cytochrome C release in treated MCF-7 cell (786, ELISA) [336], anti-cancer (786, the human breast carcinoma cell line MCF-7) [337], Immunomodulatory effect (EtOH fractions) [339]

Toxicity (extract, mice) [342], anti-tumor (820, MTT assay) [343], anti-inflammatory (1234718, superoxide inhibition) [344], cytotoxicity and anti-HIV-1 activity (shown by isolated compounds including 801, 804, 803, 813, 814, 815, 824, 828); MDAMB-435 and Hela cells, HIV-1HIVB-infected C8166 cells) [345], anti-nephrotoxic (127, gentamicin-induced renal damage in Wistar rats) [346], antioxidant, anti-inflammatory (810, 811, 812, 822, 825, 829, 830, 831, 832, 833, 834, DPPH, NO production and cell viability assay. The murine macrophage cell line RAW264.7) [347], diuretic activity (MeOH extract, male rats) [348], antiepileptic activity (MeOH extract, rat) [349], anti-hypertension (glucocorticoid-induced
hypertension, $\text{N}^\omega$-nitro-l-arginine methyl in rats) [350,351], antioxidant (polisacharide fraction, DPPH) [352]

<table>
<thead>
<tr>
<th>No.</th>
<th>Plant Name</th>
<th>Country</th>
<th>Part(s)</th>
<th>Use(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>184</td>
<td><em>Viscum ovalifolium</em> DC.</td>
<td>Cambodia, Malaysia</td>
<td>LF, WP</td>
<td>Poultice, external Leaves (poultice) to treat neuralgia, as herbal bath to treat fever in children, ash mixed with sulphur, coconut oil to treat pustular itches [353]</td>
</tr>
<tr>
<td>185</td>
<td><em>Hedychium ongi cornotum</em> Griff.</td>
<td>Indonesia</td>
<td>RZ, RT</td>
<td>Drink (decoction) Rhizome is used to treat syphilis; root is used to treat worm [58]</td>
</tr>
</tbody>
</table>

**Note:** na: not mentioned; ST: stem, PT: pith; TB: tuber; SP: spore; BK: bark; LT: latex; NT: nutmeg; SD: seed; FT: fruit; BD: buds; PD: pedi; PdB: pseudobulbs; FL: flower; PdTb: pseudotuber; BL: bulbs; STh: sheath; WP: whole; LF: leaf; RT: root; RZ: rhizome.
### Table 2. Phytochemical constituents of epiphytic medicinal plants.

<table>
<thead>
<tr>
<th>No</th>
<th>Epiphyte species</th>
<th>Constituents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adiantum caudatum L., Mant</td>
<td>16-hentriacontanone 1, 19α-hydroxyferna-7,9(11)-diene 2, 29-norhopan-22-ol 3, 3α-hydroxy-4α-methoxyflicane 4, 8α-hydroxyfernan-25,7β-olide 5, adiantone 6, filic-3-ene 7, hentriacontane 8, isoadiantone 9, quercetin-3-O-glucoside 10, β-sitosterol 11, β-sitosterol 11, β-sitosterol glucoside 12 [354–356]</td>
</tr>
<tr>
<td>2</td>
<td>Asplenium nidus L. Blechnaceae</td>
<td>(-)-epiafzelechin 3-O-β-D-allopyranoside 13, homoserine 14 [357]</td>
</tr>
<tr>
<td>4</td>
<td>Araiostegia divaricata (Blume) M. Kato</td>
<td>(-)-epicatechin 3-O-β-D-(2′-O-vanillyl)allopyranoside 31, (-)-epicatechin 3-O-β-D-(2′-trans-cinnamoyl)allopyranoside 32, (-)-epicatechin 3-O-β-D-(3′-O-vanillyl)allopyranoside 33, (-)-epicatechin 3-O-β-D-(3′-trans-cinnamoyl)allopyranoside 34, (-)-epicatechin 3-O-β-D-allopyranoside 35, (-)-epicatechin 3-O-β-D-allopyranoside 36, 24-norferna-4 (23) 37, 4β-carboxymethyl(-)-epicatechin 38, 4β-carboxymethyl(-)-epicatechin methyl ester 39, 4β-carboxymethyl(-)-epicatechin potassium 40, 9(11)-diene 41, cyanin 42, davallic acid 43, epiafzelechin-(4β→8)-epicatechin 3-O-β-D-allopyranoside 44, epicatechin-(4β→6)-epicatechin-(4β→8)-epicatechin-(4β→6)-epicatechin-D-glucocanto-β-lactone enediol 45, epicatechin-(4β→8)-4β-carboxymethylxyliponate 46, hop-21-ene 47, monardein 48, pelargonin 49, procyanidin B-2 3′-O-β-D-allopyranoside 50, sodium salts 51 [92,93,360–364]</td>
</tr>
<tr>
<td>5</td>
<td>Davallia carinata Trevis</td>
<td>18-diene 52, 18-diene 52, 19α-hydroxyfernenes 53, 19α-hydroxyfilic-3-ene 54, 2-C-β-D-glucopyranosyl-1,3,6,7-tetrahydroxyxanthone 55, 2-C-β-D-xyloryanosyl-1,3,6,7-tetrahydroxyxanthone 56, 2-C-β-D-xyloryanosyl-1,3,6,7-tetrahydroxyxanthone 56, 30-O-p-hydroxybenzoylemangiferin 57, 3-O-p-hydroxybenzoylemangiferin 58, 40-O-p-hydroxybenzoylemangiferin 59, 4-O-β-D-glucopyranosyl-2,6,4-trihydroxybenzenophene 60, 4β-carboxymethyl(-)-epicatechin 38, 4β-carboxymethyl(-)-epicatechin methyl ester 39, 4β-carboxymethyl(-)-epicatechin methyl ester 39, 60-O-p-hydroxybenzoylemangiferin 61, eriodictyol 62, eriodictyol-8-C-β-D-glucopyranoside 63, fena-9(11) 64, fern-7-en-19α-ol 65, fern-9(11)-en-19α-ol 66, fern-7 67, filic-3-en-19α-ol 68, filica-3,18,20-triene 69, filica-3,18-diene 70, icariside E3 71, icariside E5 72, mangiferin 73 [99,101,362,365,366]</td>
</tr>
<tr>
<td>6</td>
<td>Huperzia carinata (Desv. ex Poir.)</td>
<td>carinatums A, B, and C 74, 75, 76 [107]</td>
</tr>
<tr>
<td>7</td>
<td>Huperzia phlegmaria (L.) Rothm</td>
<td>14β,21α,29-trihydroxyserat-3β-yl dihydrocaffeate (lycophlegmariol D) 77, 21α,24-dihydroxyserat-14-en-3β-yl 4-hydroxycinnamate (lycophlegmariol C) 78, 21β,24,29-trihydroxyserat-14-en-3β-yl dihydrocaffeate (lycophlegmariol B) 79, 21β,29-dihydroxyserat-14-en-3α-yl dihydrocaffeate (lycophlegmariol A) 80, 21β-hydroxy-serat-14-en-3α-yl acetate 81, 21β-hydroxy-serat-14-en-3α-yl 82, 8,11,13-abietatriene-3β,12-dihydroxy-7-one (margocilin) 83, 8-deoxy-13-dehydroseratinine 84, 8-deoxyseratinitidine 85, acrifoline 86, annotine 87, annotinine 88,</td>
</tr>
</tbody>
</table>
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8 Huperzia megastachya (Baker) Tardieu

9 Nephrolepis biserrata (Sw.) Schott

Oleandraceae

Nephrolepis cordifolia (L.) C. Presl

Drynaria quercifolia Nakaike

Polypodiaceae

Drynaria propinqua (Wall. ex Mett.) Bedd

Drynaria quercifolia (L.) J.Sm.

dihydrolycopodine 89, epidihydrofawcettidine 90, fawcettidine 91, huperzine A 92, lycoodine 93, lycoflexine 94, lycephlagmarin 95, lycephlagmarin 96, lycephlagmine 97, lycoodine 98, malycon A 99, malycons B, C 100, 101, N,N'-dimethylphlegmarine 102, phlegmanol A–E 103–107, phlegmaric acid 108, α-obscurine 109, β-obscurine 110 [110,367–372]

21-cpi-serratenediol 111, 21-cpi-serratenediol-3-acetate 112, lycoclavanol 113, megastachine 114, phlegmanol-D 115, serratenediol 116, serratenediol-3-acetate 117, serratenediol diacetate 118, tohogenol diacetate [373,374]

1/β,11α-diacetoxy-11,12-epoxydrim-7-ene 120, 1/β,3β,11α-triacetoxy-11,12-epoxydrim-7-ene 121, 1/β,6α,11α-triacetoxy-11,12-epoxydrim-7-ene 122, sequoyitol 123 [363,375]

21-cpi-sserratenediol 111, 21-cpi-serratenediol-3-acetate 112, lycoclavanol 113, megastachine 114, phlegmanol-D 115, serratenediol 116, serratenediol-3-acetate 117, serratenediol diacetate 118, tohogenol diacetate [373,374]

fern-9(11)-ene 124, hentriacontanoic acid 125, myristic acid octadecylester 126, oleanolic acid 127, sequoyitol (patent) 123, triacntanol 128, β-sitosterol 11 [367,377]


kaempferol 3-O-β-D-glucopyranoside-7-O-α-L-arabinoside 138, (2R)-naringin 139, (2S)-naringenin-7-O-β-D-glucoside 140, kaempferol 3-O-α-L-rhamnosyl-7-O-β-D-glucoside 141, luteolin-7-O-β-D-neohesperidoside 142, maitol glucoside 143, (-)-epicatechin 144, 12-O-caffeoyl-12-hydroxydodecyclic acid 145, xanthohagolen 146, naringenin 147, kushenol F 148, sporafflavone G 149, kuraminone 150, leachianone A 151, 8-phenylkaempferol 152, kaempferol 153, chratone 154, fern-9(11)-ene 155, hop-22(29)-ene 156, isoglaucanone 157, dryocrassol 158, dryocrassol acetate 159, (+)-afzelechin-3-O-β-D-allopyranoside 160, (+)-afzelechin-6-C-β-D-glucopyranoside 161, 4α-carboxymethyl-(-)-catechin methylester 162, (-)-afzelechin-4β-8)-(-)-epiafzelechin-(4β-8)-4β-carboxymethyl(-)-epiafzelechin methyl ester 163, (-)-epiafzelechin-(4β-8)-4β-carboxymethyl(-)-epicatechin methyl ester 164, (-)-epiafzelechin-(4β-8)-4α-carboxymethyl(-)-epiafzelechin ethyl ester 165, (-)-epiafzelechin-3-O-β-D-allopyranoside 166, (-)-epicatechin-3-O-β-D-allopyranoside 167, (+)-catechin 168, 4β-carboxymethyl(-)-epiafzelechin methyl ester 169, 4β-carboxymethyl(-)-epiafzelechin 170, (-)-epiafzelechin-(4β-8)-epiafzelechin-(4β-8)-epiafzelechin methyl ester 171, (-)-epiafzelechin 172, (-)-epiafzelechin-(4β-8)-4β-carboxymethyl-epiafzelechin methyl ester 173, epiafzelechin-(4β-8)-epiafzelechin 174, (+)-afzelechin 175, (-)-epiafzelechin-3-O-β-D-allopyranoside 176, (-)-epiafzelechin-8-C-β-D-glucopyranoside 177, (-)-epiafzelechin-5-O-β-D-allopyranoside 178, drynachromoside A 179, drynachromoside B 180, fortunodial 181, curcume 182, demethoxycurcumene 183, bisdemethoxycurcumene 184, bavachin 185, isobavachalcone 186, (-)-epicatechin 144, liquiritine 187, bakuchiol 188, protocatechuic acid 189, (-)-5,7,3',5'-tetrahydroxyflavone 7-O-neohesperidoside 190, (2S)-5,7,3',5'-tetrahydroxyflavone 7-O-β-D-glucopyranoside 191, 5,7,3',5'-tetrahydroxyflavane 192, 3',lavandulyl-4-methoxy-2,2',4',6'-tetrahydroxylcalone 193, 5,7-dihydroxychromene-7-O-β-D-glucopyranoside 194, 5,7-dihydroxychromene-7-O-neohesperidosyl 195 [76,379–383]

friedelin 196, epifriedelinol 197, β-amyrin 198, β-sitosterol 11, 3-O-β-D-glucopyranoside 199, 3,4-dihydroxybenzoic acid 200, acetylleupeol 201 [129,385]
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15 **Drynaria rigidula** (Sw.) Bedd.

fenn-9(11)ene 202, hop-22(29)-ene 156, γ-sitosterol 203, 3,4-dihydroxybenzoic acid 200, 4-hydroxybenzoic acid 204, 4-hydroxyphenyl-1-(2-arabinopyranosyl)-tetrahydro-2H-pyran-3,4,5-triol 205, 4-hydroxyphenyl-1-tetrahydro-2H-pyran-3,4,5-triol 206, kaempferitrin 207, 3,5-dihydroxy-flavone-7-O-β-rhamnopyranosyl-4'-O-β-glucopyranoside 208 [125,386]

16 **Phymatosorus scolopendria** (Burman f.) Pic. Serres.

1,2-benzopyrone (coumarin) 209 [80]

17 **Pyrosia lingua** (Thunb.) Farw.


18 **Pyrosia petiolaris** (Christ) Ching


19 **Pyrosia sheareri** (Baker) Ching

diploptene 210, β-sitosterol 11, vanillic acid 225, protocatechuic acid 189, mangiferin 73, fumaric acid 231, sucrose 232 [75]

**Psilotaceae**

20 **Psilotum nudum** (L.) P. Beauv


21 **Acrostichum aureum** (L.) P. Beauv

queretin 3-O-β-D-glucoside 245, ponasterone A 246, lupeol 247, friedelin 196, β-sitosterol 11, stigmasterol 248, campesterol 249, tetracosanoic acid 250, ursolic acid 251, gallic acid 252, (2R,3S)-sulfated pterosin C 253, (2S,3S)-sulfated pterosin C 254, (2S,3R)-sulfated pterosin C 255, (2R)-sulfated pterosin P 256, patricascabratine 257, tetracosane 258, quercetin-3-O-β-D-glucoside 259, quercetin-3-O-β-D-glucosyl-(6→1)-α-L-rhamnose 260, quercetin-3-O-α-L-rhamnose 261, quercetin-3-O-α-L-rhamnopyranosyl-7-O-β-D-glucoside 262, kaempferol 153 [68,395–397]

22 **Selaginella involvens** (P. Beauv.) Spring

hexadecanoic acid 263, stearic acid 264, β-sitosterol 11, stigmasterol 248, amentoflavone 265, β-D-glucopyranoside 266, (3β)-cholest-5-en-3-yl 267, β-amyrin 198 [398]

**Vittariaceae**

23 **Vittaria elongate** Sw.

vittarin-A-F 268–273, 3-O-acetylnidulic acid 274, ethyl 3-O-acetylnidulate 275, methyl 4-O-coumaroylquinone 276, vittariilide-A, B 277, 278, vittariilavone 279, methyl 4-O-cafeoylquinate 280, ethyl 4-O-cafeoylquinate 281, methyl 5-O-cafeoylquinate 282, apigenin 132, vitexin 283, 5,7-dihydroxy-3',4',5'-trimethoxyflavone 284, amentoflavone 265, trans-p-coumaric acid 285, methyl trans-p-coumarate 286, methyl caffeate 287, ferulic acid 288, p-cresol 289, 4-hydroxybenzaldehyde 290, 4-hydroxybenzoic acid 294, methyl 4-hydroxybenzoate 291, protocatechuic acid 226, protocatechuic acid 189, methyl protocatechuic acid 292, vanillin 293, vanillic acid 225 [149]

**Non-Fern Balsaminaceae**

24 **Impatiens niamniamensis** Gilg

a-N,N,N-trimethyltryptophan betaine 294 [159]
25  Convolvulaceae (parasite)  
26  Cassytha filiformis L.  
    N-(3,4-dimethoxyphenethyl)-4,5-methylenedioxy-2-nitrophénolactamide 295, actinodaphine 296, cassylthine 297, isoboldine 298, cassameridine 299, cassamedine 300, lysacin 301, cathafile 302, cathafomine 303, actinodaphine 304, N-methylactinodaphine 305, cathafiline 306, cathafomine 307, predicentrine 308, ocoteine 309, filiformine 310, (+)-diisyaingaresinol 311, cathafiline 312, cathafomine 313, actinodaphine 314, N-methylactinodaphine 315, predicentrine 308, ocoteine 316, neolitine 317, dicentrine 318, cassylthine (cassylthine) 319, actinodaphine 320, 4-O-methylbalanophonin 321, casyfoin 322, isofilorinine 323, cassythic acid 324, cassythic acid 324, cassythic acid 325, neolitnine 326, dicentrine 318, 1,2-methylenedioxy-3,10,11-trimethoxyphosphine 327, (-)-O-methylflavinatine 328, (-)-salutaridine 329, isohamnetin-3-O-β-glucoside 330, isohamnetin-3-O-β-glucoside 331 [164,378,399–403]  
27  Cuscuta australis R.Br.  
    4-oic acid-7-oxo-kaurene-6α-O-β-D-glucoside 332, thymidine 333, cafeic acid 225, p-coumaric acid 334, cafeic-β-D-glucoside 335, kaempferol 153, quercetin 336, astragalin 337, hyperoside 338, astragalin 339, kaempferol 153, quercetin 336, β-sitosterol 11, β-sitosterol 3-O-β-D-xilopyranoside 340 [404–406]  
28  Cuscuta reflexa Roxb.  
    coumarin 341, α-amyrin 342, β-amyrin 198, α-amyrin acetate 343, β-amyrin acetate 344, oleanolic acid 345, oleanolic acid 127, stigmast 248, lupeol 247, stigmast-5-en-3-O-β-D-glucopyranoside tetraacetate 346, stigmast-5-en-3-O-β-D-glucopyranoside 347, stigmast-5-en-3-yl-acetate 348, β-sitosterol 11, 3,5,7,3′,4′-pentahydroxyflavanone (taxifolin) 349, 3,5,7,4′-tetrahydroxyflavanone (aromadendrin) 350 [169,407,408]  
29  Clusiaceae  
    Clusia grandiflora Splittg. (hemi epiphyte)  
30  Loganiaceae  
    Fagraea auriculata Jack. (semi epiphyte)  
Loranthisae (parasite)  
31  Dendrophthoe falcata (L.f.) Ettingsh.  
32  Loranthus globosus Roxb  
    (+)-catechin 168, 3,4-dimethoxycinnamyl alcohol 370, 3,4,5-trimethoxycinnamylalcohol 371 [190]  
33  Macrosolen cochinchinensis (Lour.) Tiegh.  
    Scurrula atripurpurea (Blume) Danser  
    octadeca-8,10,12-triynoic acid 376, hexadec-8-ynoic acid 377, hexadec-10-ynoic acid 378, hexadec-8,10-diyanoic acid 379, hexadeca-6,8,10-triynoic acid 380, hexadeca-8,10,12-triynoic acid 381, (Z)-9-octadecenoic acid 382, (Z, Z)-octadec-9,12-dienoic acid 383, (Z, Z, Z)-octadec-9,12,15-trienoic acid 384, octadeca-8,10-diynoic acid 385, (Z)-octadec-12-ene-8,10-diyanoic acid 386, octadeca-8,10,12-triynoic acid 376, theobromine 387,
40 Scurrula ferruginea
(Jack) Danser
glycoside 4'-O-acetyl-quercitrin 394 [412]

41 Scurrula parasitica L.
(+)catechin 168 [204]

42 Ficus pumila L.

Orchidaceae
38 Anoeocthisformosanus Hayata
(6R,9S)-9-hydroxy-megastigma-4,7-dien-3-one-9-O-β-D-glucopyranoside 409, (R)-(−)-3,4-dihydroxybutanoic acid γ-lactone 410, 1-O-isopropyl-β-D-glucopyranosyl(1,2)-5-hydroxymethylfuran 411, 1-O-isopropyl-β-D-glucopyranosyl(1,2)-5-hydroxybenzylic acid 412, 3-(R)-3,5-dihydroxyfla"mailine 413, 3-(R)-3,5-dihydroxyfla"mamylosylybutanolid (kinesinoside) 414, 4-(β-D-glucopyranosyl)-benzyl alcohol 415, corchoionoside C 416 [416]

39 Anoeocthis rosburghii (Blume)
24S-isopropylenol-cholest er 417, 5-hydroxy-3,4,7-trimethoxy flavonol-3-O-β-D-rutinoside 418, 7-O-β-D-diglucoside 419, 8-Cβ-hydroxybenzylic acid 420, 8-p-hydroxybenzyl quercetin 421, anocetoxy-benzyl quercetin 422, campesterol 249, cirsilene 423, daucosterol 134, ferulic acid 288, isorhamnetin 424, isorhamnetin-3-O-β-D-glucoside 426, isorhamnetin-3-O-β-D-rutinoside 427, isorhamnetin-7-O-β-D-glucopyranoside 428, isorhamnetin-7-O-β-D-digitoxoside 429, kaempferol-3-O-β-D-glucopyranoside 430, kaempferol-3-O-β-D-glucopyranoside 431, p-coumaric acid 334, p-hydroxybenzaldehyde 432, quercetin 336, quercetin 3-O-β-D-glucopyranoside 433, quercetin 3-O-β-D-glucopyranoside 434, quercetin 7-O-β-D-rutinoside 435, quercetin 7-O-β-glucoside 436, quercetin 7-O-β-D-glucosylylon-3-β(1′-O-(trans-feruloyl))glucopyranoside 437, sitosterol 438, stigmasterol 248, succinic acid 439, 3′,4′,7-trimethoxy-3,5-dihydroxyflavone 440, 3-methoxy-p-hydroxybenzaldehyde 441, daucosterol 134, daucosterol 134, ferulic acid 288, isorhamnetin-3-O-β-D-rutinoside 443, lanosterol 444, methyl vinyl β-D-glucopyranosylbutanoate 445, o-hydroxy phenol 446, oleanolic acid 127, palmic acid 447, p-hydroxybenzaldehyde 448, p-hydroxy cinnamic acid 449, p-hydroxybenzaldehyde 452, quercetin 3-O-β-p-coumarate 450, sorghumol 3-O-β-D-glucuronide 451, stearic acid 264, succinic acid 452, β-D-glucopyranosyl(3-OH)-β-glucuronol 453, β-sitosterol 11 [395–403]

40 Bulbophyllum kwangtungense Schltr.
10,11-dihydro-2,7-dimethoxy-3,4-methylenedioxydibenz[b,f]oxepin 454, 5-(2,3-dimethoxyphenethyl)-6-methylenobenz[b][34,36]dioxole 455, 7,8-dihydro-3-hydroxy-12,13-methylenedioxy-11-methylenobenz[b,f]oxepin 456, 7,8-dihydro-4-hydroxy-12,13-methylenedioxy-11-methylenobenz[b,f]oxepin 457, 7,8-dihydro-5-hydroxy-12,13-methylenedioxy-11-methylenobenz[b,f]oxepin, cumulatin 459, densiflorol A 460, plicatol B 461 [245,417]

41 Bulbophyllum odoratissimum (Sm.) Lindl. ex Wall.
(+)-l-tyrosinesol-3-O-β-D-glucopyranoside 462, 3,5-dimethoxyphenethyl alcohol 463, 3,7-dihydroxy-2,4,6-trimethoxyphenanthrene 464, 3,7-dihydroxy-2,4,6-trimethoxyphenanthrene 465, 3,6-dimethoxy-4-hydroxy cinnamic acid 466, 3,6-dimethoxyphenethyl alcohol 4-O-β-D-glucopyranoside 467, 4-hydroxy-3,5-dimethoxybenzaldehyde 468, 4-O-β-D-glucopyranoside 469, 7-hydroxy-2,3,4-trimethoxy-9,10-dihydrophenanthrene 470, batatasin III 471, Bulbophyllanthrone 472, bulbophythin A, B 473, 474, Coelolin 475, densiflorol B 476, ethyl orsellinat 477, gigantol 478, moscatin 479, p-hydroxyphenylpropionic acid 480, p-hydroxyphenylpropiolic methyl ester 481, syringaldehyde 482, syringin 483, tristin 484, vanillic acid 225 [249,250,418–421]
Bulbophyllum vaginatum (Lindl.) Rchb.f. (±)-syringaresinol 485, (2R,3S)-3-hydroxymethyl-9-methoxy-2-(4'-hydroxy-3',5'-dimethoxyphenyl)-2,3,6,7-tetrahydrophenanthro [4,3-b]furan-5,11-diol 486, 2,4-dimethoxyphenanthrene-3,7-diol 487, 3,4,6-trimethoxyphenanthrene-2,7-diol 488, 3,4,6-trimethoxy-9,10-dihydrophenanthrene-2,7-diol 489, 3,4,5-trihydroxy-3'-methoxybibenzyl (tristin) 490, 3,4-dihydroxy-5,5'-dimethoxybibenzyl 491, 3,4-dihydroxybenzoic acid 492, 3,4-dimethoxy-9,10-dihydrophenanthrene-2,7-diol (erianthradin) 493, 3,4-dimethoxyphenanthrene-2,7-diol (nudol) 494, 3,5-di-methoxy-9,10-dihydrophenanthrene-2,7-diol (6-methoxycoelonin) 495, 3,4-dihydroxy-5,5'-dimethoxybibenzyl 496, 4',6,6'-tetramethoxy-[1',2',2',3',7',7',7'-hexol 497, 4,6-dimethoxy-9,10-dihydrophenanthrene-2,3,7-triol 498, 4,6-dimethoxyphenanthrene-2,3,7-triol (coelonin) 499, 4-methoxyphenanthrene-2,7-diol (flavanthrin) 500, 4-methoxyphenanthrene-2,3,5-triol (fimbriol B) 501, 9,10-dihydrophenanthrenes 502, dihydroferulic acid 503, Friedelin 504, p-coumaric acid, 334 [69,422,423].

Catasetum barbatum (Lindl.) Lindl. 2,7-dihydroxy-3,4,8-trimethoxyphenanthrene 505 [251].

Cymbidium aloifolium (L.) Sw. aloifol I 506, aloifol II 507, 6-O-methylcoelonin 508, batatasin III 471, coelonin 475, gigantol, 478, 1-(4'-hydroxy-3',5'-dimethoxyphenyl)-2-(3'-hydroxyphenyl)ethane 479, 2,4-dihydroxy-4,6-dimethoxy-9,10-dihydrophenanthrene 511, cymbinin-A 512, cymbinin B 513 [424–426].

Cymbidium goeringii (Rchb.f.) Rchb.f. β-sitosterol 11, daucosterol 134, ergosterol 514, gigantol 478, cymbidine A 515 [255,256,427].

Dendrobium amoenum Wall. ex Lindl. amotin 516, amoenin 517, amoenumin 518, amoeylin, isoamoeylin 519, 3,4'-dihydroxy-5-methoxybibenzyl, 520, 4,4'-dihydroxy-3,3',5'-trimethoxybibenzyl (moscatilin) 521 [428–430].

Dendrobium chryseum Rolfe araxerol 522, coumarin 523, moscatilin 524, chrysotobibenzyl 525, chrysotoxin 525, gigantol 478, kaempferol 153, cis-mellilotoside 526, defuscin 527, dendroforin 528, dengisbin 529, dichromelilotoside 530, naringenin 147, 7-octacosyl ferulate 531, trans-mellilotoside 532 [259,431].


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50  **Dendrobium**
    **fimbriatum** Hook.

51  **Dendrobium**
    **loddigesii** Rolfe

52  **Dendrobium**
    **moniliforme** (L.) Sw.

53  **Dendrobium**
    **moschatum** (Buch.-Ham) S.w

54  **Dendrobium**
    **nobile** Lindl.

55  **Epidendrum**
    **strobiliferum** Rchb.f.

56  **Epidendrum**
    **rigidum** Jacq.

57  **Mycaranthes**
    **pannea** (Lindl.) S.C.Chen & J.J.Wood

58  **Camaridium**
    **densum** (Lindl.) M.A.Blanco

59  **Nidema**
    **boothii** (Lindl.) Schltr.

60  **Pholidota**
    **articulata** Lindl.

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2-hydroxyethyl caffeate 593, ayapin 594, chrysophanol 583, chrysotobenzyl (l) 595, confusarin 596, crepidatin 584, defuscin 527, denhydroshizukanolide 597, fimbriatone 598, n-dotriacontanoic acid 599, n-octacosyl ferulate 531, n-triacetyl cis-p-coumarate 571, physcion 592, rhein 600, scopolin methyl ether 601, β-sitosterol 11 [432,433]

dendrophenol (4,4'-dihydroxy-3,3',5-trimethoxybenzyl) 563, loddigesinols A-D 602-605, moscatilin 523, moscatilin diacetate 606, moscatin 479, shihunidine 607, stibunes 608, stilbenes 609 [275-277]

heptacosane 610, 3,4-dihydroxy-4',5-dimethoxy bibenyl 611, 3,4-dihydroxy-5,4'-dimethoxy benzyl 612, 4-methoxybenzaldehyde 613, a known alkaloid 6-oxhydroxynaphthalene 614, alkyl 4'-hydroxy-cis-cinnamates 615, alkyl ferulates 616, daucosterol 134, denbinbin 552, denbinbin, alkyl 4'-hydroxy-trans-cinnamates 617, dromendilide E 562, ethyl linolenates 618, heptatriacontaneoic acid 619, linoleic acid 620, methyl linolenates 621, moniliformin 622, monilin 623, n-nonacosane 624, n-octacosyl ferulate 531, n-triacetyl p-hydroxy-cis-cinnamate 625, octacosanyl hexadecanoate 626, phytosterols 627, stigmast-4-en-3-one 628, vanillin 293, α-dihydrocicretoxinin 629, β-sitosterol 11 [285,434-438]

moscatin 479, moscatilin 523 [254,428-432]


24-methylenecycloartanol 676, campesterol 249, pholidiotin 677, stigmasterol 248, β-sitosterol 11 [297]


Acervatol 687, acervatone 688, flavantherdin 669, flavantherin 689 [301]

2,5-dihydroxy-3,4-dimethoxyphanathrene 690, 2,5-dihydroxy-3,4-dimethoxyphanathrene 691, 9,10-dihydro-2,5-dihydroxy-3,4-dimethoxyphanathrene 691, 9,10-dihydro-2,7-dihydroxy-3,4-dimethoxyphanathrene 692, eperemanthidine 667, fimbriol-A 693, gymnopin 694, nudol 695 [70,445]

1,5,7-trimethoxy-9,10-dihydrophanathrene-2,6-diol 696, 1,5,7-trimethoxyphanathrene-2,6-diol 697, 2,4-dimethoxyphanathrene-3,7-diol 488, 9,19-cyclolanostane-24,24-dimethyl-25-en-3β-ol trans-p-hydroxyxinnamate 698, aloifol I 507, batatasin III 471, eperemanthol B 699, eperemanthodine 700, gigantol 478, lusianthridin 671, moscatilin 523, moscatin 479, gigantol 478, nobilin D-E 701, 702 [307,446]

2,7-dihydroxy-3,4,6-trimethoxyla 9, 10-dihydrophanathrene flavidin 703, 2,7-dihydroxyyl-methoxy-9,10-dihydrophanathrene (coeloin) 704, 9, 10-dihydrophanathrenes 705, coelogenin 706, coelogenin 707, flavidin 708, flavidin 709, oxoflavidinin 710 [447]
61 Pholidota chinensis Lindl. (E)-2',3',3'-trihydroxy-5-methoxystilbene (pholidotol C) 711, (Z)-3',3'-hydroxy-5-methoxystilbene (pholidotol D) 712, 2,4,7-trihydroxy-9,10-dihydrophenanthrene 539, 2,5-dimethoxy-3,4,4'-bis(dimethylenedioxy)benzyl 713, 3,4'-dihydroxy-3',5-dimethoxybenzyl 714, 3,4-dihydroxy-4-methoxyhydrodistilbene 715, 4',4'-dihydroxydiphenylmethane 716, 4,5-dihydroxy-2-methoxy-9,10-dihydrophenanthrene 717, 5,3'-dihydroxy-2,3-(methylenedioxy)benzyl 718, 9,10-dihydro-2,4-dihydroxy-7-methoxyphenanthrene 719, batatasin III 471, blestranol A 720, blestin A 721, bulbohypol B 722, cannabidiohydrophenanthrene 723, coelolin 475, coelolin 476, cyclopolidone 724, cyclopolidone 725, cyclopolidone 725, erianthinidin 667, euphol 726, flavanthrin 727, flavanthrin 727, gymcospin C 728, hircinol 670, lusianthridin 671, lusianthridin 671, phochinenins A – F 729–734, phochinenins G-L 735–740, pholidotols A-B 741, 742, 3,4-dihydroxy-5-methoxyhydrodistilbene 743, phoyunnanin D 744, 6-hydroxybenzaldehyde 432, p-hydroxybenzyl alcohol 745, protocatechuic aldehyde 746, resveratrol 747, thunaballene 748, thunaballene 749, trans-3,3-dihydroxy-2,5-dimethoxystilbene 750, trans-3-hydroxy-2,3,5-trimethoxystilbene 751, β-daucosterol 752 [310,311,434,435,448,449]

62 Scaphyglottis livida (Lindl.) Schltr. 24,24,diethyl-9,19-cyclolanosta-9(11),25-dien-3-one (cyclobalane) 753, 3,4-dihydroxy-3',4,5-trimethoxybenzyl 754, 3',4'-dihydroxy-3',5-dimethoxybenzyl 714, 3,7-dihydroxy-2,4,8-trimethoxyphenanthrene 755, 3,7-dihydroxy-2,4-dimethoxyphenanthrene 756, 5α-lanosta-24,24-dimethyl-9(11),25-dien-3β-ol 757, batatasin III 471, coelolin 475, gigantol 478, nidemin 701 [313,314,446]

63 Papilionanthe teres (Roxb.) Schltr. eucomic acid 758, vandatosides I-III 759–761 [319]

64 Vanda tessellate (Roxb.) Hook. ex G. Don. Oxtessallatin 762 [436]

Piperaceae

65 Peperomia galioides Kunth (+)-epi-α-bisabolol 763, galopiperone 764, grifolic acid 765, grifolin 766, hydropiperone 767, piperogalin 768, piperogalone 769 [437,438,450]

66 Piper retrofractum Vahl 28-methylnonacos-27-en-1-oic acid 770, 3-methyl-5-decanoylpyridine 771, caffeic acid 228, di-methyl 3,4-bis(4-hydroxyphenyl)-1,2-cyclobutanedicarboxylate 772, esculetin 773, methyl piperate 774, N-isobutylyleicosa-2,4-dienamide 775, p-coumaric acid 334, pipereicosaldehyde 776, piperine 777, piperonaline 778, piperoctadecaldehyde 779, retrofractamide-D 780, retrofractamides A, C 781, 782, uracil 783, uridine 575, vitamin 238, vitamin 2'-O-β-glucopyranoside 784, 5,6,7-trihydroxy-9,10-dihydrophenanthrene 799, 2-deoxy-epi-inositol 799, 2-phenylethanol 800, 4-O-glucosylflavan-3-ol 801, 4'-hydroxy-7,3'-dimethoxyflavan-5-0-β-D-glucopyranoside 802, 4-O-cinnamoyl quinic acid 803, 5,3',4'-trihydroxyflavanone-7-O-β-D-glucopyranoside 804, 5,4'-dihydroxyflavanone-7-O-β-D-lucopyranoside 805, 7-O-β-D-glucopyranoside 806, botulin 807, betulin 808, betulinic acid 809, cinnamic acid methyl ester 810, cinnamylpropane glycoside 811, eriodictyol 7-O-β-D-glucopyranoside 812, homooridictyol 7-O-β-D-glucopyranoside 813, homoeriodictyol-7-O-β-D-glucopyranoside 814, homoeriodictyol-7-O-β-D-glucopyranoside-4'-O-β-D-(5″-cinnamoyl)apiofuranoside 815, homoeriodictyol-7-O-β-D-glucopyranoside-4'-O-β-D-apiofuranoside 816, lupenyl
acetate 817, lupeol 247, lupeol acetate 818, lupeol palmitate 819, lupeol stearate 820, lycorin 821, methylparaben 822, naringenin 7-O-β-D-glucopyranoside 823, Oleanolic acid 127, p-hydroxybenzaldehyde 432, p-hydroxy-benzoic acid 824, pinocembrin 825, pinocembrin 7-O-β-D-glucopyranoside 826, pinocembrin-7-O-[cinnamoyl (1→5)-β-D-apiofuranosyl (1→2)]-β-D-glucopyranoside 827, pinocembrin-7-O-β-D-apiofuranosyl(1→2)-β-D-glucopyranoside 828, pinocembrin-7-O-β-D-apiofuranosyl(1→5)-β-D-apiofuranosyl(1→2)-β-D-glucopyranoside 829, protocatechuic acid 189, vanillin 293, visartisides A-C 830, 831, 832, visartisides D-F (4–6) 833, 834, 835, viscumitol 836, α-amyrin 342, β-amyrin acetate 837, β-sitosterol 11 [343–347,455–457]

Viscum ovalifolium

69 Viscum ovalifolium DC

3-O-α-L-arabinopyranoyl-hederagenin-28-O-β-D-glucopyranosyl (1→6)-β-D-glucopyranoside 838, gypsogenic acid 839, hederagenin 840, hederagenin-3-O-α-L-arabinopyranoside 841, hederagenin-3-O-α-L-arabinopyranoyl-(2→1)-O-β-D-glucopyranoside 842, lupeol acetate 818, lupeol palmitate 819, oleanolic acid 127, lupeol stearate 820, β-amyrin 198, β-amyrin acetate 344 [458,459]
6. Conclusions

Epiphytes are the most beautiful vascular plants and contain interesting phytochemicals and possess exciting pharmacological activities. An analysis of the literature revealed 185 epiphytes that are used in traditional medicine, in which phytochemical studies identified a total of 842 secondary metabolites. Only 71 epiphytic medicinal plants were studied for their pharmacological activities and showed promising pharmacological activities, including anti-inflammatory, antimicrobial, and anticancer. Several species were not investigated for their activities and are worthy of exploration, including epiphytes from the Araceae (P. fragantissimum), Aralliaceae (S. caudata, S. elliptica, S. elliptifoliola, S. oxyphylla, S. simulans), and Asclepiadaceae (Asclloidea sp., D. acuminata, D. benghalensis, D. imbricate, D. nummularia, D. platyphylla, D. purpurea, Toxocarpus sp) families, in which no phytochemical and pharmacological studies had been reported. These species have been used by Indigenous populations to treat both degenerative and nondegenerative diseases. It is known that there are examples of Indigenous populations living in protected forest reserves (e.g., in Indonesia) where epiphytes are used in their medicine, e.g., some species of Dischidia are used to treat fever, eczema, herpes etc.; these plants have not yet been studied. Therefore, the possibility of responsible bioprospecting exists (in compliance with the Nagoya protocol), which would be invaluable in biodiscovery knowledge as well as in mutual benefit sharing agreements.

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