

Epiphytic orchids (Orchidaceae) as promising therapeutics against premature skin ageing

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Abstract: Skin ageing is a complex biological process influenced by intrinsic factors and external stressors such as ultraviolet radiation, oxidative stress, pollution and chronic inflammation. Increasing demand for natural and sustainable skincare products has intensified interest in plant-derived bioactive compounds with dermatoprotective and anti-ageing properties. Epiphytic orchids of family Orchidaceae have a rich phytochemical constitution with significant cosmeceutical potential. Traditionally, many species have been used for treating skin related ailments. Recent studies have reported that, orchids such as *Vanda coerulea*, *Vanda teres* and *Dendrobium formosum* possess antioxidant, anti-inflammatory, photoprotective and collagen-protective activities due to the presence of compounds such as stilbenoids, gigantol, anthocyanins and vandaterosides. These compounds help reduce reactive oxygen species (ROS), suppress inflammatory mediators, inhibit matrix metalloproteinases (MMPs) and improve extracellular matrix integrity, thereby contributing to anti-ageing effects. This review highlights the ethnomedicinal importance, phytochemistry and anti-ageing potential of epiphytic orchids and reviews their role in modern cosmetology and skincare applications.

Keywords: Antiageing factors, anti-inflammation, antioxidants, cosmeceuticals, environmental stress, orchids

Introduction

Our skin is continuously exposed to environmental stress factors such as ultraviolet (UV) radiation, pollution, oxidative stress and microbial infections, which contribute to premature ageing and various dermatological disorders like psoriasis, acne, hyperpigmentation, solar elastosis, etc (Parrado et al., 2019). Skin ageing is primarily characterized by wrinkles, loss of elasticity, dehydration, pigmentation and reduced collagen synthesis, primarily resulting from increased production of reactive oxygen species (ROS) and chronic inflammation (Zhang and Duan, 2018). In recent years, the growing reports of skin disorders and the increasing demand for natural and sustainable skincare products have accelerated research into plant-derived bioactive compounds for cosmetic and therapeutic applications (Michalak et al., 2023). Modern cosmetology currently focuses on natural products with antioxidant, anti-inflammatory, photoprotective and regenerative properties that can protect the skin against various harmful factors and delay visible signs of premature ageing. Among medicinal plants, orchids (family Orchidaceae) are one of the oldest and largest families which comprise of more than 28,000 species all over the world (Pessoa et al., 2025). They have attracted a considerable attention not only because of their aesthetic looks but also due to their rich diversity of secondary metabolites which includes phenanthrenes (5-hydroxy-2-methoxy-1,4-phenanthrenequinone and ephemeranthoquinone B), stilbenoids (like gigantol, imbricatin, methoxycoelonin and tristin), flavonoids (Rutin, quercetin, kaempferol, catechin, etc), alkaloids (like dendrobine) and polysaccharides (Teoh, 2016). These compounds exhibit a wide range of biological activities relevant to skin health, such as free radical scavenging, inhibition of inflammatory mediators, collagen protection and enhancement of skin barrier function (Li et al., 2023). Especially epiphytic orchids (Plate 1), which grow on other plants for structural support without deriving nutrients from them, represent an important group within Orchidaceae with significant ethnomedicinal and cosmeceutical potential. Traditionally, several epiphytic orchid species have been used in the treatment of wounds, burns, skin eruptions, inflammatory conditions and various skin related problems, showing their long term use in field of dermatological care (Gautam et al., 2025). Recent pharmacological studies have further demonstrated their anti-ageing potential of through antioxidant, anti-inflammatory and photoprotective mechanisms. Therefore, it becomes crucial to study epiphytic orchids as potential natural sources of anti-ageing compounds for the development of novel skincare and cosmeceutical formulations.

Methodology

The present study is based on an extensive survey of published literature related to the family Orchidaceae. We consulted scientific databases, including Google Scholar, Scopus, PubMed and Web of Science, to retrieve peer-reviewed research articles, review papers, ethnobotanical surveys and pharmacological studies. A variety of keywords such as “Orchidaceae”, “antioxidant activity”, “antiageing properties”, “skincare”, “anti-inflammatory”, “orchids”, “cosmetic active agents” and “ethnopharmacology” were used to identify relevant publications. Additionally, we examined regional floras, books and reports that document traditional knowledge and distribution patterns. Only studies containing verifiable scientific or ethnomedicinal data were included in the analysis. The

information gathered was critically analyzed and systematically organized into thematic sections to ensure clarity and coherence (Kumar, 2025; Sahu et al., 2026).

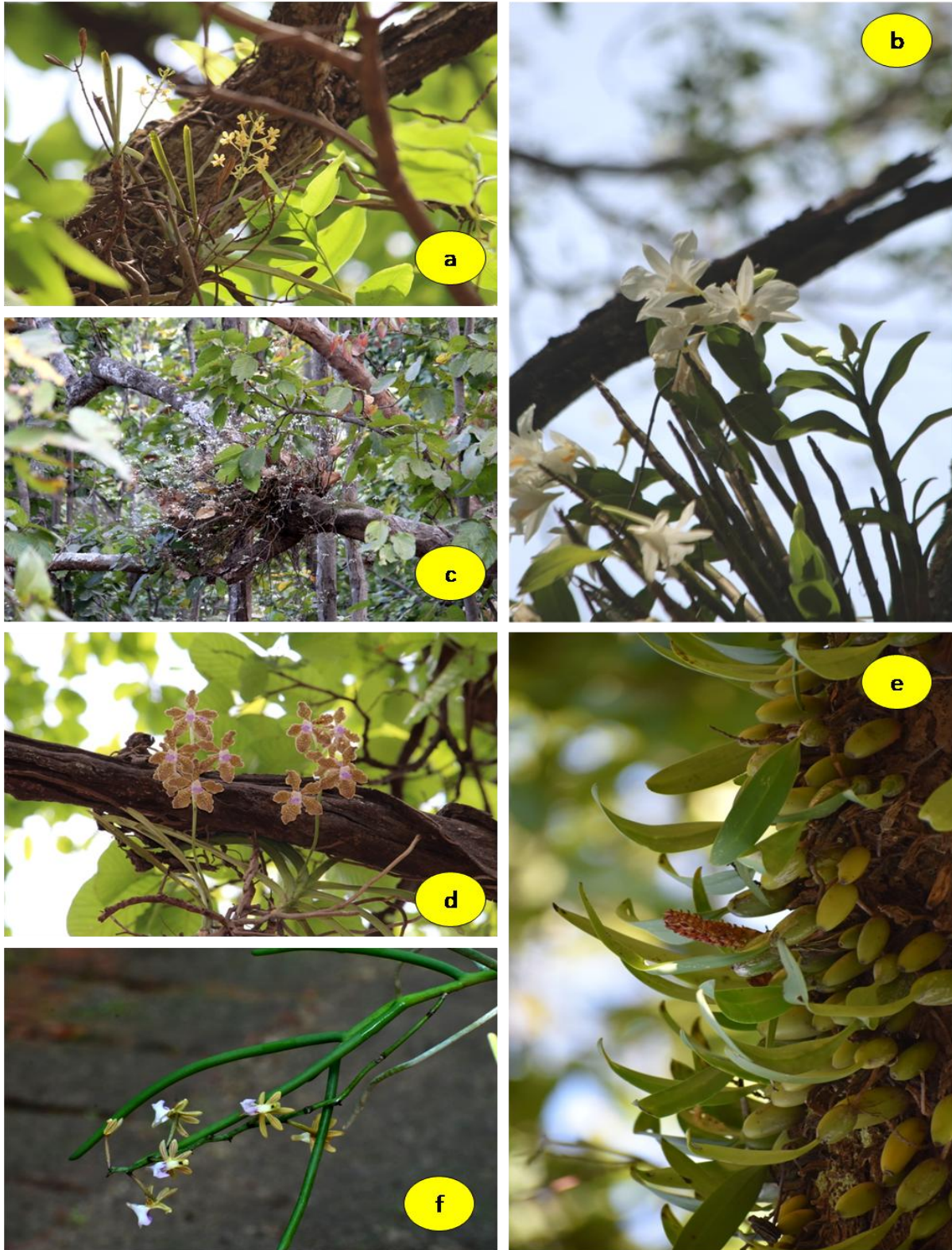


Plate 1: Members of family Orchidaceae; (a) *Vanda testacea* (b) *Dendrobium formosum* (c) *Dendrobium herbaceum* (d) *Vanda tessellate* (e) *Bulbophyllum careyanum* and (f) *Cleisostoma appendiculatum*

Antioxidant, anti-inflammatory and antiageing properties of selected species of Orchidaceae

Epiphytic orchids possess significant potential as sources of anti-ageing and skin-protective bioactives. Traditionally, many species have been used to treat wounds, burns, skin eruptions, ulcers and inflammatory conditions, establishing their relevance in traditional dermatological care which can be incorporated into today's modern skin health and cosmetological studies (Table 1). Among them, *Vanda* species are comparatively well studied and contain bioactive compounds such as stilbenoids, gigantol, anthocyanins and vandaterosides with antioxidant, anti-inflammatory and photoprotective activities (Hadi et al., 2015). Species such as *Aerides multiflora*, *Aerides odorata*, *Luisia zeylanica* and *Rhynchostylis retusa* are associated with wound healing and tissue regeneration (Gautam et al., 2025). In addition, orchids such as *Bulbophyllum odoratissimum* and *Vanda tessellata* exhibit anti-inflammatory properties relevant to skin ageing. Similarly, *Dendrobium formosum* has shown the ability to reduce UVB-induced ROS production and suppress MMP-1 expression, indicating its potential in preventing collagen degradation and photoageing (Thungmungmee et al., 2025).

Table 1: Skin-related ethnomedicinal uses and anti-ageing activities of selected epiphytic orchids

Species	Part(s) used	Skin related ethnomedicinal use	Reported pharmacological relevance to anti-ageing	Source(s)
<i>Aerides multiflora</i> Roxb.	Leaves, stem, pseudobulb, flowers, fruits	fruit used for wound healing	Wound healing, skin regeneration	Gautam et al., (2025)
<i>Aerides odorata</i> Lour.	Root, leaves	Treats wounds and cuts	Tissue repair and skin recovery	Gautam et al., (2025)
<i>Bulbophyllum careyanum</i> (Hook.) Spreng (Plate 1e)	Leaves, stem/pseudobulb	Used in burns and wound recovery	Burn healing, anti-inflammatory skin applications	Gautam et al., (2025)
<i>Bulbophyllum odoratissimum</i> (Sm.) Lindl. ex Wall.	Whole plant, stem, pseudobulb	Used in chronic inflammation	Anti-inflammatory potential relevant to skin ageing	Gautam et al., (2025)
<i>Coelogyne corymbosa</i> Lindl.	Stem, pseudobulb	Juice used for burns	Burn healing and skin soothing	Gautam et al., (2025)
<i>Dendrobium formosum</i> Roxb. ex Lindl. (Plate 1b)	Leaves	Leaf paste is used in treatment of wounds	Anti-ageing, antioxidant, photoprotective	Taylor et al., (2024); Thungmungmee et al.,

				(2025)
<i>Dendrobium herbaceum</i> Lindl (Plate 1c)	Roots	Fresh roots ash with mustard oil is used for skin healing at affected parts	Wound healing, Anti-inflammatory, antioxidant activity	Wang, (2021)
<i>Dendrobium monticola</i> P.F. Hunt & Summerh.	Whole plant	Used in skin eruptions	Dermatological applications	Gautam et al., (2025)
<i>Luisia zeylanica</i> Lindl.	Leaves	Used in wounds, boils and burns	Skin healing and antimicrobial care	Gautam et al., (2025)
<i>Pholidota articulata</i> Lindl.	Root	Used for eruptions and skin ulcers	Treatment of damaged/ inflamed skin	Gautam et al., (2025)
<i>Renanthera imschootiana</i> Rolfe	Leaves	Used in skin diseases as topical application	Dermatoprotective potential	Gautam et al., (2025)
<i>Rhynchosyilis retusa</i> (L.) Blume	Root, whole plant	In wound treatment	Skin repair and regeneration	Gautam et al., (2025)
<i>Vanda coerulea</i> Griff. ex Lindl.	Stems, roots; bioactive compounds (Stilbenoids, gigantol; anthocyanins, etc.)	Used as eye drops for glaucoma, cataract and blindness	Potential active ingredient for anti-ageing and skin photoprotective formulations	Hadi et al., (2015)
<i>Vanda teres</i> (Roxb.) Lindl.	Aerial parts (leaves, stems); bioactive compound (Vandaterosides)	Traditionally used in ear infection, nose bleeding and pyrexia	Anti-inflammatory, antioxidant, extracellular matrix protective, skin revitalizing	Hadi et al., (2015)
<i>Vanda tessellata</i> (Roxb.) Hook. ex G. Don (Plate 1d)	Roots, leaves, flowers	Leaf juice is used in treatment of boils on the	Potential use in skin soothing formulations	Chowdhury et al., (2014); Gautam et al., (2025)

		scalp		
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Research gaps

Orchid-derived cosmeceuticals have gathered significant attention but research on anti-ageing compounds from epiphytic orchids remains limited. Most available studies are preliminary and focus mainly on *in vitro* investigations. In-depth research on molecular mechanisms, bioactive compound isolation and clinical efficacy are still insufficient. Only well known species of *Vanda* and *Dendrobium* have been scientifically evaluated for skin-related activities, whereas many traditionally used epiphytic orchids remain unexplored. Comprehensive pharmacological studies regarding conservation, commercial and sustainable utilization in dermatology and cosmetology also need to be accessed.

Future aspects

Advanced analytical techniques and molecular studies can help analyze the mechanisms involved in antioxidant, anti-inflammatory and photoprotective activities of the orchid species. In addition, nanotechnology-based and targeted delivery systems may enhance the stability, skin penetration and efficacy of orchid-derived formulations. Clinical trials are essential to validate safety and therapeutic effectiveness in humans. Sustainable cultivation and conservation strategies should also be prioritized, as many orchid species are rare and ecologically sensitive.

Conclusion

Epiphytic orchids represent valuable natural resources with considerable potential for anti-ageing and skin-protective applications. Traditional medicinal uses, together with emerging scientific evidence, demonstrate that these orchids possess antioxidant, anti-inflammatory, wound-healing and photoprotective properties relevant to modern skincare and cosmetology. Bioactive compounds such as stilbenoids, anthocyanins, gigantol and vandaterosides contribute significantly to reducing oxidative stress, protecting collagen integrity and preventing photoageing. Although current findings are promising, further research is required to fully explore their phytochemistry, mechanisms of action, safety and clinical efficacy. Epiphytic orchids hold strong promise as future sources of natural anti-ageing agents for the development of effective and sustainable cosmeceutical formulations.

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