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ORIGINAL RESEARCH

Dendrobium and Orchidaceae Plants in Dermatology: A PubMed-Based Bibliometric Analysis and Mechanistic Overview

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Purpose: Dendrobium ("Shihu") and other Orchidaceae plants have been investigated as adjunctive options for inflammatory dermatoses, wound repair, and topical skin care. However, clinically relevant evidence and safety information remain scattered across phytochemistry, experimental dermatology, biomaterials, and formulation science. This study used bibliometric methods to map publication patterns and identify themes most closely related to dermatologic mechanisms and safety reporting.

Methods: PubMed was searched on January 19, 2026 using a reproducible query that combined Orchidaceae/Dendrobium terms with dermatology and clinical/safety concepts. Records indexed from January 1, 2006 to January 19, 2026 were exported in MEDLINE format and analyzed in R with bibliometrix (v4.3.0) to summarize annual output, contributions by countries and institutions, collaboration networks, source journals, author productivity, and term co-occurrence with burst detection.

Results: The final dataset contained 103 records. Annual output increased over time and peaked in 2025 (n=24). China contributed the largest share of publications and occupied a central position in international co-authorship networks. The literature was distributed across 64 journals and covered constituent characterization, experimental models, and delivery/materials-oriented studies. Recent term evolution highlighted growing attention to oxidative stress, signal transduction, and wound repair, whereas safety-related terminology appeared less frequently.

Conclusion: Research on Orchidaceae-derived constituents relevant to dermatology is expanding, but clinically oriented evidence remains limited and reporting is heterogeneous, particularly with respect to botanical authentication, extract/formulation characterization, clinically interpretable endpoints, and adverse-event documentation. Better clinical translation will require transparent composition reporting and prospective studies that combine mechanism-linked biomarkers with systematic safety assessment.

Keywords: Dendrobium, Orchidaceae, dermatology, bibliometric analysis, wound healing, polysaccharides

Introduction

Skin diseases are among the most common reasons for dermatology consultation and often require long-term management. Even when guideline-recommended therapies are available, chronic inflammatory dermatoses such as atopic dermatitis and psoriasis may still be complicated by relapse, incomplete response, tolerability concerns, and the need for sustained immunomodulation.

Botanical medicines are frequently used alongside conventional dermatologic care. Analyses of large prescription and health-record datasets have shown that allergic and inflammatory skin diseases are common indications for traditional Chinese medicine, and that multi-herb regimens often cluster around anti-inflammatory and barrier-supportive strategies.[1,2]

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Orchidaceae species, particularly Dendrobium, have long been used in East Asian materia medica and are increasingly being investigated for dermatology-related applications. Their major metabolite classes, including polysaccharides, alkaloids, flavonoids, bibenzyl derivatives, and phenanthrenes, are important because they may contribute differently to anti-inflammatory activity, oxidative-stress regulation, photoaging mitigation, wound repair, barrier support, and topical formulation performance. Although experimental studies have described multiple biologic effects, the link between constituent identity, formulation characteristics, and clinically meaningful skin outcomes remains inconsistently reported across studies.[3–6]

Despite the growth of preclinical and formulation-oriented studies, clinically interpretable evidence remains fragmented across phytochemistry, disease models, biomaterials, and cosmetic science. No bibliometric study has specifically mapped the Orchidaceae/Dendrobium literature from a dermatology perspective or examined how safety information is represented within this body of work. PubMed was selected as the source database because its biomedical focus and standardized MeSH indexing are well suited to clinically oriented mapping of dermatology and safety concepts.

Accordingly, this study performed a PubMed-based bibliometric analysis of clinical-application and safety-related publications on Dendrobium and other Orchidaceae plants in dermatology from 2006 to 2026. The aim was to characterize the research landscape, identify emerging topical themes, and highlight reporting and safety gaps relevant to clinical and cosmetic dermatology.

Methods

Data Source and Search Strategy

PubMed (US National Library of Medicine) was searched on January 19, 2026. The publication date filter was set from January 1, 2006 through January 19, 2026. PubMed was used as the sole database for this bibliometric mapping because it provides consistent biomedical coverage and standardized MeSH indexing for dermatology- and safety-related terminology. The operational search string was: ((Dendrobium[Title/Abstract] OR Orchidaceae[Title/Abstract] OR orchid*[Title/Abstract]) AND (skin[Title/Abstract] OR cutaneous[Title/Abstract] OR dermatology[Title/Abstract] OR dermatologic*[Title/Abstract] OR dermatological[Title/Abstract] OR dermatitis[Title/Abstract] OR eczema[Title/Abstract] OR acne[Title/Abstract] OR photoaging[Title/Abstract] OR "skin aging"[Title/Abstract] OR "wound healing"[Title/Abstract] OR wound*[Title/Abstract] OR ultraviolet[Title/Abstract] OR UV[Title/Abstract] OR topical [Title/Abstract] OR cosmetic*[Title/Abstract] OR cosmeceutical*[Title/Abstract]) AND (therapy[Title/Abstract] OR treatment[Title/Abstract] OR therapeutic*[Title/Abstract] OR clinical[Title/Abstract] OR trial[Title/Abstract] OR safety [Title/Abstract] OR "adverse effect*"[Title/Abstract] OR toxicity[Title/Abstract] OR tolerability[Title/Abstract] OR biocompatibility[Title/Abstract])) AND ("2006/01/01"[Date - Publication]: "2026/01/19"[Date - Publication]).

Eligibility Criteria

We included original research articles and review articles that investigated or discussed Dendrobium or other Orchidaceae-derived materials with dermatology relevance (clinical dermatology, cosmetic dermatology, skin biology, photoaging, dermatitis/inflammation, acne, wound repair, topical delivery, or safety/tolerability outcomes). We excluded editorials, letters, conference abstracts without sufficient data, and records without skin- or dermatology-relevant endpoints.

Study Selection and PRISMA Flow

Records were exported from PubMed in MEDLINE (NBIB) format on January 19, 2026. Duplicates were assessed using PubMed IDs (PMIDs); no duplicate PMIDs were identified in the exported dataset. Two investigators independently screened titles and abstracts for dermatology relevance and eligibility; full texts were consulted when abstracts were insufficient. No records were excluded after screening because the deliberately restrictive retrieval strategy had already required concurrent botanical, skin-related, and clinical/safety concepts. Disagreements were resolved by discussion. The selection process is summarized in Figure 1 (PRISMA flow diagram).

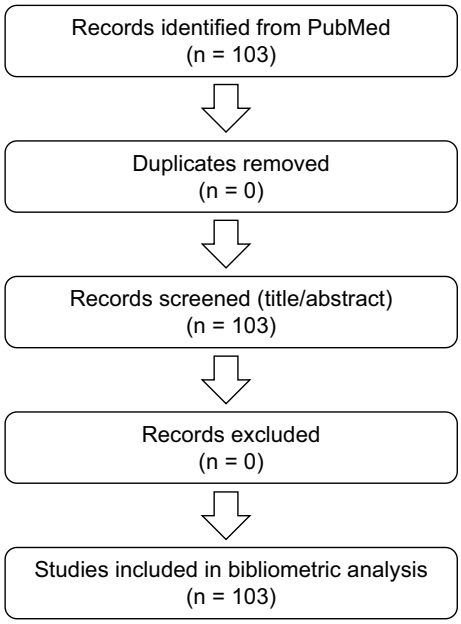

Figure 1 PRISMA flow diagram for study identification, screening, and inclusion (PubMed search on January 19, 2026).

Data Export, De-Duplication, and Cleaning

Search results were exported from PubMed in MEDLINE (NBIB) format and archived as an Excel file. Records were imported and parsed; unique PubMed IDs (PMIDs) were used as the primary identifier, and duplicates were removed by PMID before analysis. For collaboration analyses, the affiliation field was split into individual affiliation sentences and cleaned to remove e-mail address fragments (eg, "Electronic address:"), raw e-mail strings, and placeholder values (eg, "NOTREPORTED") prior to extracting institution and country information; country names were normalized (eg, China vs CHINA; USA vs United States).

Bibliometric and Network Analysis

We summarized annual publication output and document types (Figure 2), country contributions and international collaboration (Figure 3), institutional productivity and collaboration networks (Figure 4), and author productivity and co-authorship structure (Figure 5). Source journals were summarized using the full journal title field (JT) (Figure 6A). To visualize relationships among the most active journals, we constructed a journal similarity network for the top 20 journals based on overlap in their MeSH descriptor profiles; similarity was computed using Jaccard coefficients and edges with similarity ≥0.12 were displayed (Figure 6B). Term structure was examined using PubMed MeSH terms (MH). For a publication-ready co-occurrence map, we focused on high-frequency MeSH terms (frequency ≥6) and retained only edges supported by ≥3 co-occurrences (Figure 7A). Burst detection was performed on yearly term frequencies (2006–2026) using Kleinberg's algorithm as implemented in bibliometrix; the top recent burst terms and their burst strengths are reported (Figure 7B).

Citation Analysis

Because PubMed does not provide standardized citation counts or complete cited-reference fields for citation-based bibliometrics, global citations (TC) and historiographic/cocitation indicators were not calculated.

Results

Study Set and Publication Trend

The final dataset comprised 103 publications indexed between 2006 and January 19, 2026. Original research articles accounted for 98 records (95.15%), whereas reviews represented 5 records (4.85%) (Figure 2A). Annual output was low

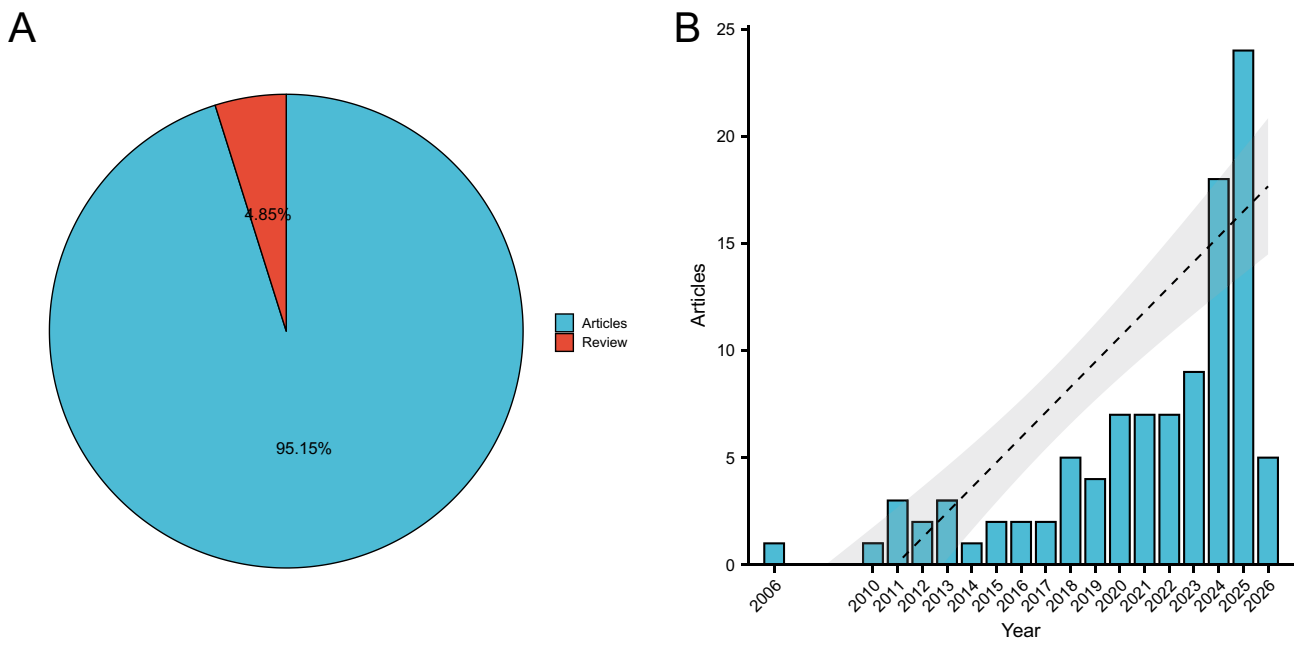

Figure 2 Publication type and annual output. (**A**) Proportion of document types (articles vs reviews) in the dataset. (**B**) Annual publication output of PubMed-indexed Orchidaceae/Dendrobium dermatology literature (2006–2026; 2026 is partial-year output).

and intermittent before 2014, increased after 2018, and peaked in 2025 (n=24) (Figure 2B). The 2026 count (n=5) reflects the partial-year cutoff at the time of data retrieval.

Countries/Regions and Collaboration

Researchers from 16 countries/regions contributed to the included publications. Output was concentrated in Asia, with China contributing the largest number of records (Figure 3A). Among the five most productive countries (China, South Korea, Thailand, India, and Japan), China also showed higher multiple-country publication activity and sustained growth over time (Figure 3B). In the international co-authorship network, China served as a major hub linking to South Korea, the United States, France, Egypt, the United Kingdom, and Uzbekistan. Additional collaboration clusters were observed (eg, Thailand–India–Malaysia and Italy–Spain–Turkey–Iraq–Vietnam–Mauritius) (Figure 3C).

Institutions and Institutional Collaboration

The most productive institutions were predominantly based in China and Thailand (Figure 4A). Guangzhou University of Chinese Medicine contributed five publications, followed by South China University of Technology (n=4). Several institutions contributed three publications each, including Beijing Technology and Business University, Chengdu University of Traditional Chinese Medicine, Jilin Agricultural University, Chulalongkorn University, and Rangsit University. Additional contributors with two publications included Kyung Hee University, Stony Brook University, and China Medical University (Figure 4A). Institution-level collaboration networks were constructed after cleaning affiliation strings and excluding non-institutional entries; the resulting map showed multiple collaboration clusters (eg, Guangzhou University of Chinese Medicine–Guizhou Medical University and Chengdu University of Traditional Chinese Medicine–Stony Brook University) (Figure 4B).

Authors and Co-Authorship Structure

Author productivity was concentrated in a small number of teams (Figure 5A). Li Wei and Zeng Rui each contributed four publications within the dataset, while several other authors (eg, Cheng Zhiqiang, Liu Wencong, and Liu Yan) contributed three publications The co-authorship network showed multiple closely connected clusters with relatively

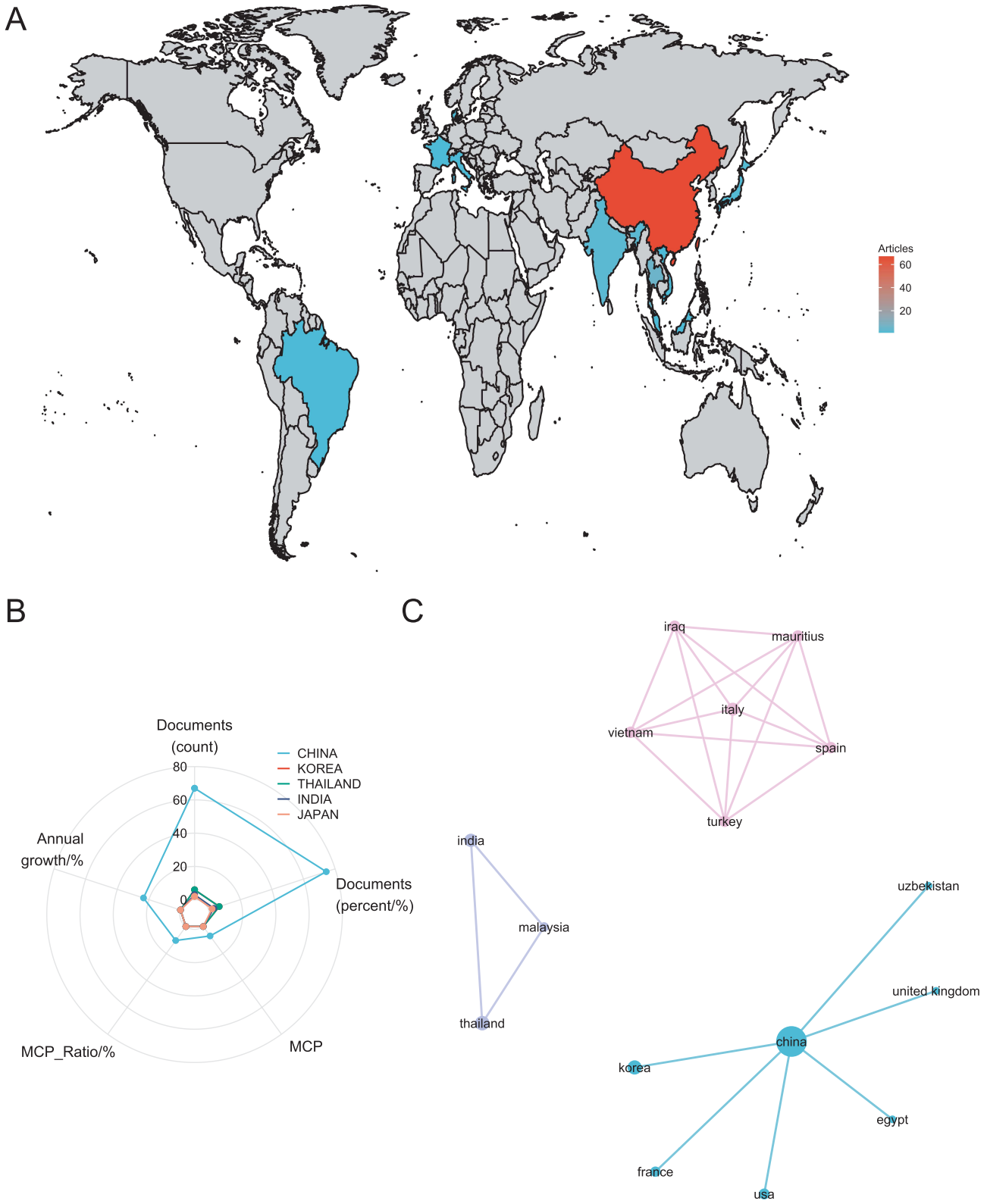

Figure 3 Country contributions and international collaboration. (**A**) Global distribution of included publications by country/region (based on cleaned affiliation metadata). (**B**) Radar chart comparing the top 5 contributing countries (documents, share, multiple-country publications [MCP], MCP ratio, and annual growth). (**C**) International co-authorship network; node size reflects publication output and edge thickness reflects collaboration frequency.

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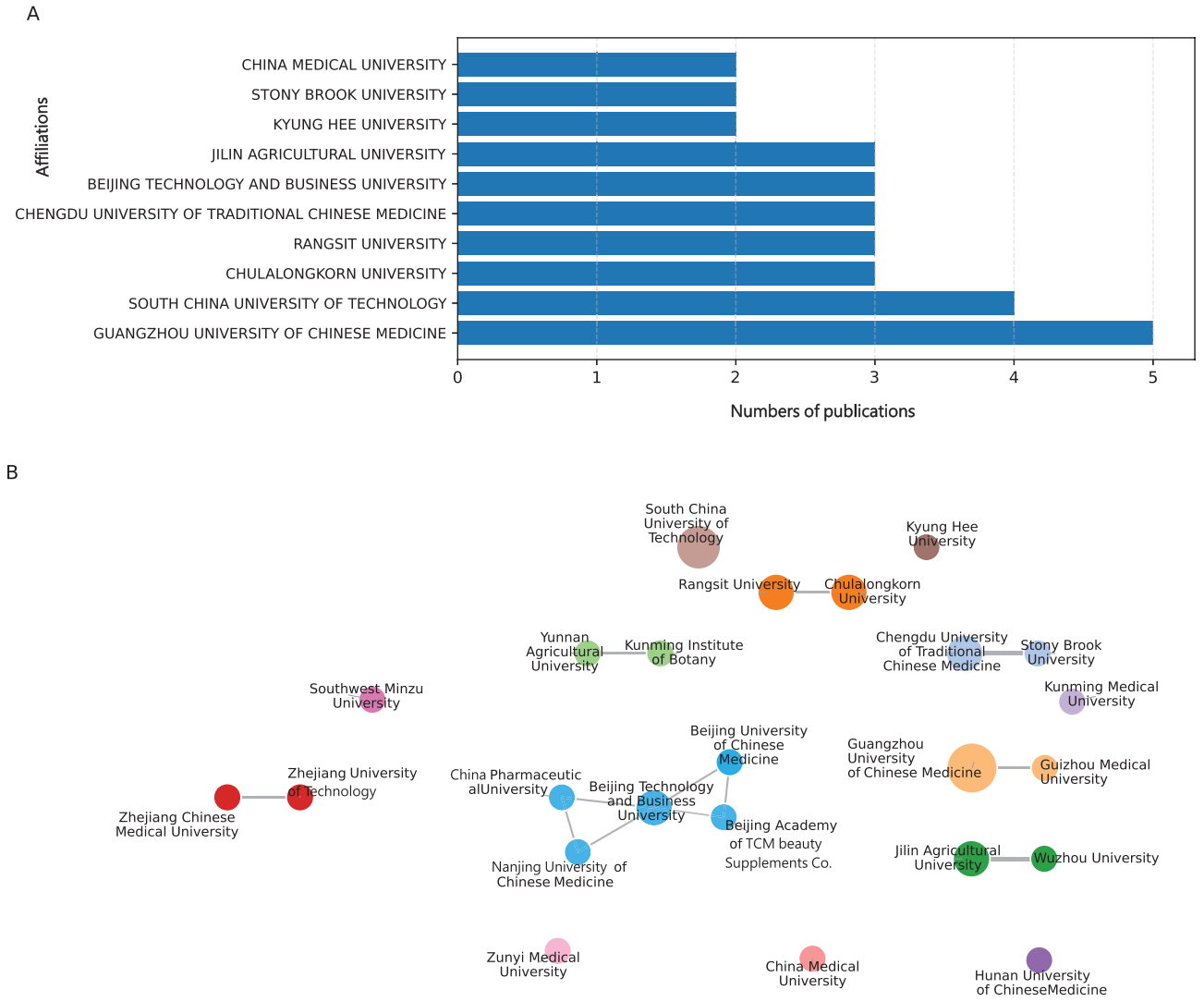

Figure 4 Institutional productivity and collaboration. (**A**) Top contributing institutions by number of publications after cleaning affiliation strings. (**B**) Institutional collaboration network based on co-authorship links after removing e-mail fragments and placeholder/non-institutional entries; node size reflects publication count and edge thickness reflects collaboration frequency.

limited bridging between clusters, suggesting that research activity is organized around several cohesive groups rather than a single highly integrated community (Figure 5B).

Journals and Disciplinary Dispersion

The 103 publications were distributed across 64 journals, consistent with an interdisciplinary field. International Journal of Biological Macromolecules published the largest number of included articles (n=15), followed by Journal of Ethnopharmacology (n=9) and Carbohydrate Polymers (n=4) (Figure 6A). The source network connected journals in ethnopharmacology, dermatology, molecular and cell biology, and drug delivery/materials science, illustrating cross-disciplinary linkages in publication venues (Figure 6B).

Keywords and Thematic Evolution

Using high-frequency MeSH terms (frequency ≥6) to improve readability, the co-occurrence map centered on general study descriptors (Humans, Animals, Mice; Male/Female) and dermatology-relevant mechanistic/application terms. Frequently co-occurring terms included Orchidaceae/chemistry, Dendrobium/chemistry, polysaccharides/chemistry/pharmacology, reactive oxygen species/metabolism and oxidative stress/drug effects, ultraviolet rays/adverse effects, skin

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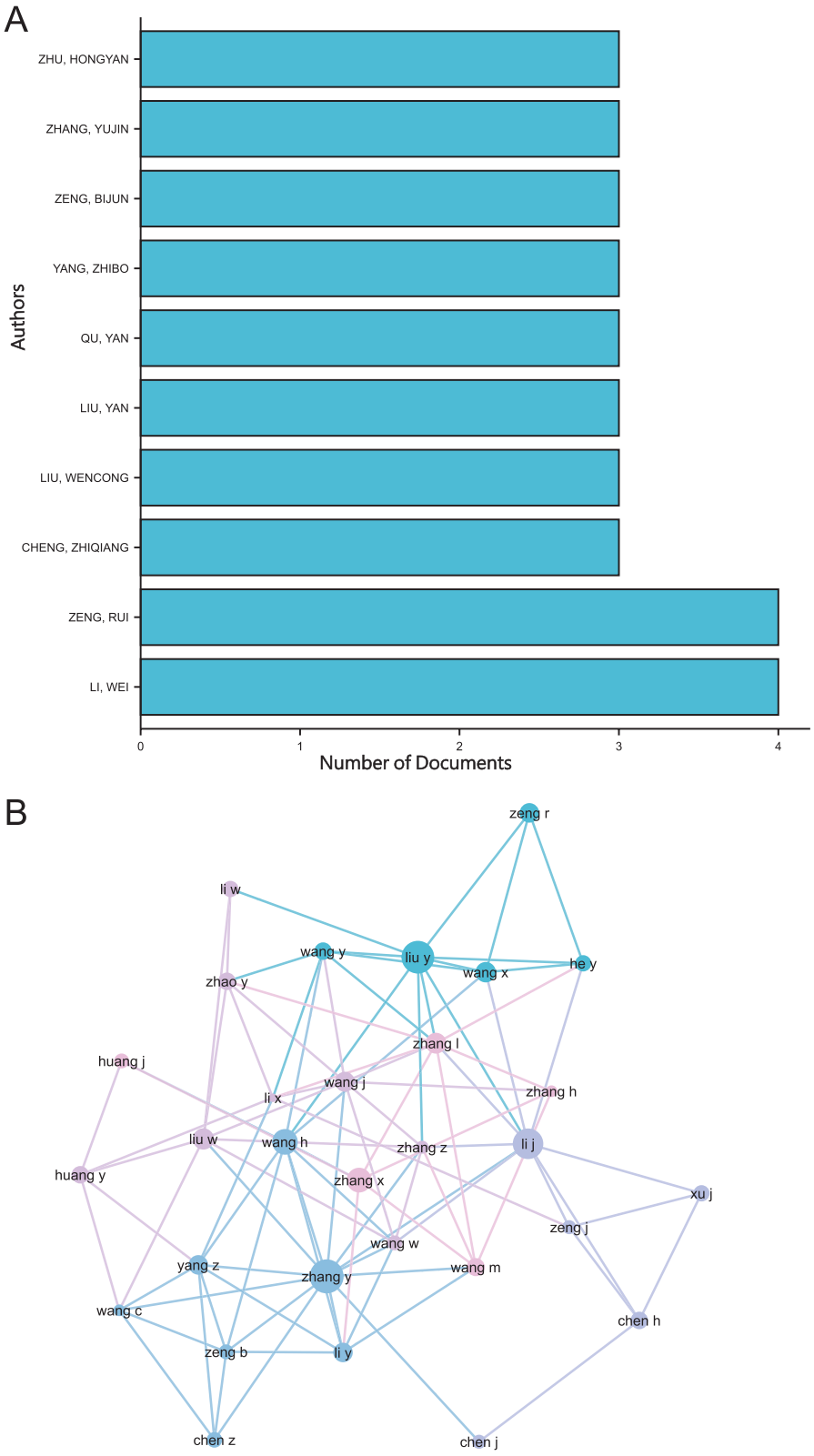

Figure 5 Author productivity and co-authorship structure. (**A**) Top authors by number of publications in the included PubMed dataset (x-axis: Number of publications). (**B**) Co-authorship network among the most connected authors; node size reflects productivity and edges indicate co-authorship links.

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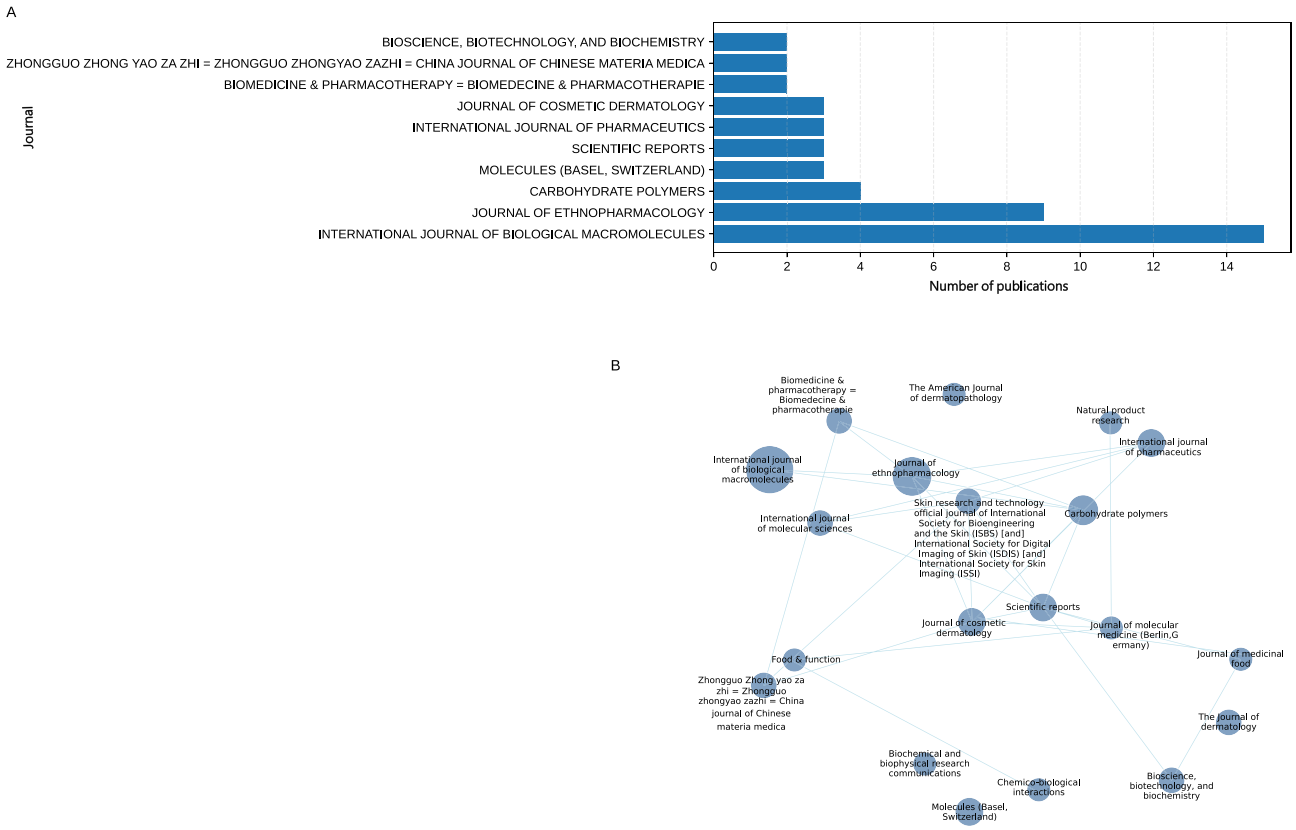

Figure 6 Source journals and journal network. (**A**) Distribution of included publications across the top source journals. (**B**) Similarity network of the top 20 journals based on overlap in MeSH descriptor profiles (Jaccard similarity; edges shown for similarity ≥0.12); node size reflects journal output and edge thickness reflects similarity.

aging/drug effects, wound healing/drug effects, and hydrogels/chemistry/pharmacology (Figure 7A). Burst detection suggested increasing attention to "reactive oxygen species/metabolism" and "mice" beginning in 2022, intensification of "polysaccharides/chemistry/pharmacology" after 2024, and recent emergence of "signal transduction/drug effects" and "wound healing/drug effects" in 2025–2026 (Figure 7B).

Discussion

Research Landscape and Collaboration Patterns

This PubMed-based bibliometric analysis identified 103 publications from 2006 to January 2026 that linked Dendrobium or other Orchidaceae plants to dermatology-related topics, including inflammatory dermatoses, photoaging, wound repair, and topical formulations. Publication activity remained limited before the late 2010s, increased after 2018, and rose further in 2024–2025. These findings indicate growing interest in mechanism-based and repair-oriented applications of Orchidaceae-derived materials in dermatology.

The literature was distributed across 64 journals spanning ethnopharmacology, biomaterials, experimental dermatology, and clinically oriented skin research. This interdisciplinary distribution reflects the vitality of the field, but it also reveals substantial variation in reporting practices. Botanical authentication and extract characterization are often described in greater detail in phytochemistry studies, whereas materials-focused reports may provide more limited compositional information. Likewise, dermatologic outcome measures are not applied uniformly across publication venues.

The co-authorship network revealed several closely connected teams with relatively limited cross-cluster collaboration. Such fragmentation may hinder comparison across studies because different groups often use different models, endpoints, and reporting conventions. Greater consistency in voucher information, extraction and formulation parameters, compositional fingerprints, and predefined skin endpoints would improve comparability and facilitate translation.

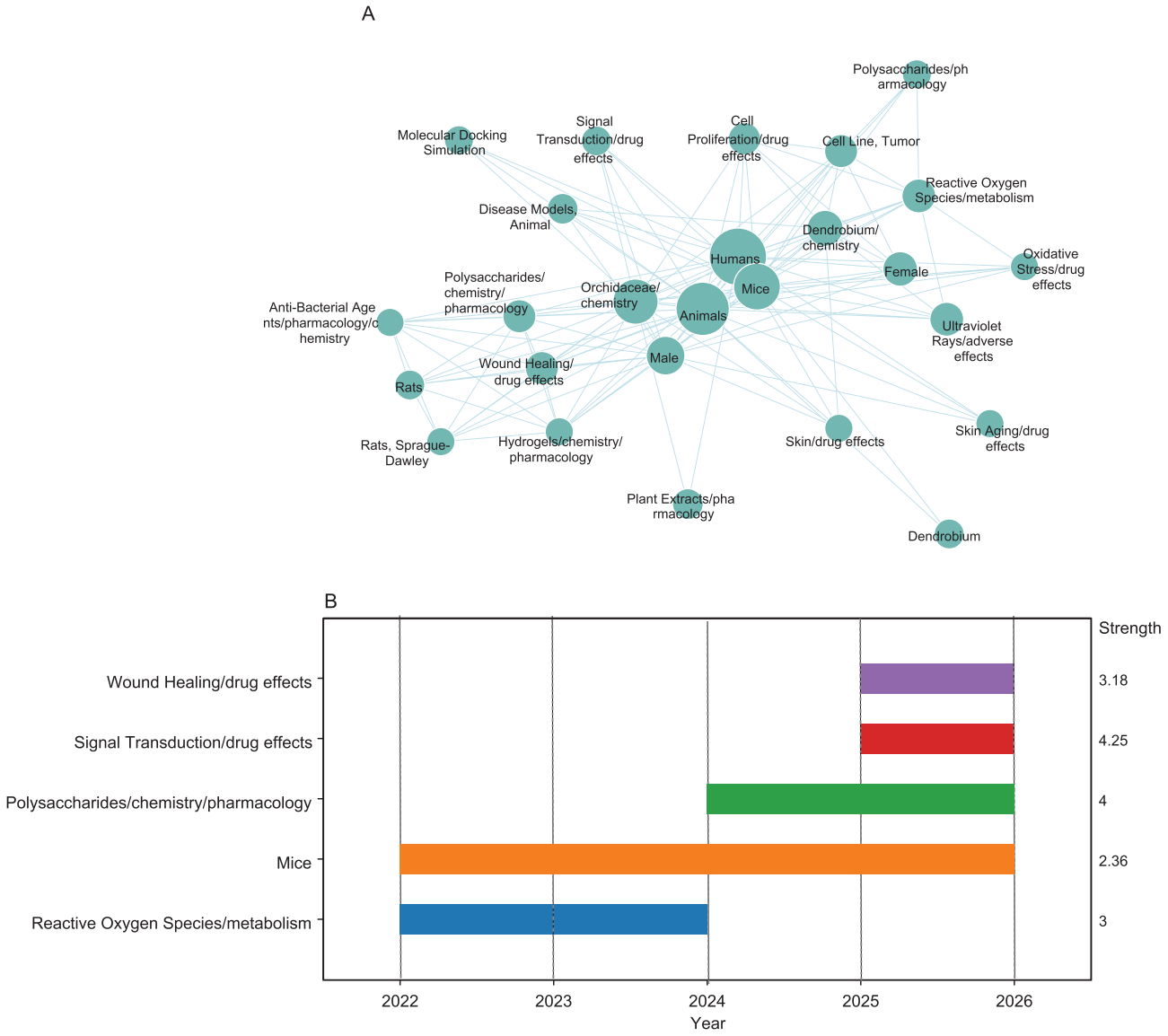

Figure 7 MeSH term structure and burst detection. (**A**) Co-occurrence network of high-frequency MeSH terms (frequency ≥6) with edges filtered for readability (edge weight ≥3). (**B**) Top burst terms identified by burst detection, with burst strength and start/end years across 2022–2026.

Geographic Concentration

China contributed the largest share of publications and occupied a central position in the international collaboration network. This pattern is consistent with broader bibliometric observations in Chinese university research and traditional medicine scholarship.[7,8] Given the concentration of output, external validation in other research settings, regulatory environments, and skin populations will be important for strengthening the generalizability of future clinical and cosmeceutical applications.

Thematic Evolution and Translational Relevance

Thematic evolution suggests that the field is moving beyond descriptive constituent studies toward mechanism-linked and repair-oriented research. Recent bursts for "signal transduction/drug effects" and "wound healing/drug effects" indicate increasing attention to pathway-based interpretation and therapeutic application. This trend is consistent with broader bibliometric analyses of natural products in wound healing[9] and with synthesis-level evidence describing the anti-inflammatory mechanisms of Dendrobium constituents.[10]

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Oxidative stress and photoaging remain major themes in the literature, consistent with the prominence of "reactive oxygen species/metabolism" and "oxidative stress/drug effects" in the MeSH network. In fibroblast models, Dendrobium nobile polysaccharides have been reported to attenuate UVA-induced changes through JNK/c-Jun/MMP signaling.[11] Similar fractions have also been associated with reduced UVB photodamage in mice through modulation of oxidative and inflammatory mediators.[12] In addition, topical Dendrobium officinale flower extracts have been linked to improvement in oxidative stress-related aging parameters.[13] Nevertheless, translating antioxidant findings into clinically meaningful dermatologic benefits requires clearer dose-response data, standardized comparators, and endpoints that are interpretable in clinical or consumer settings, such as barrier function, erythema, wrinkle assessment, or validated photographic grading. As reported for other botanical extracts studied in dermatitis models, specificity of effect and comparator selection remain important when positioning Orchidaceae-derived products.[5]

In addition to oxidative stress, many studies continue to focus on canonical inflammatory pathways, particularly NF-κB, in dermatitis-like models. Dendrobium nobile has been reported to attenuate atopic dermatitis-like lesions through immune-cell modulation.[14] Dendrobium officinale polysaccharides have also been associated with improvement in DNFB-induced dermatitis in mice through suppression of MAPK/NF-κB/STAT3 signaling.[15] For translational purposes, pathway-based observations are most informative when they are accompanied by clinically relevant endpoints and appropriate comparators, such as transepidermal water loss, pruritus-related mediators, or validated histologic scores.

Wound repair and formulation science represent another prominent research direction. Hydrogels recur frequently in the MeSH network, and the recent burst of polysaccharide-related terms suggests growing interest in the dual role of these constituents as both bioactive agents and functional biomaterials. Representative studies include supramolecular assemblies of Dendrobium officinale polysaccharides with hyaluronic acid for moisturizing applications,[16] microneedle systems incorporating Dendrobium polysaccharides for acne-directed delivery,[17] and ionic hydrogels designed to remodel the diabetic wound microenvironment and promote repair.[18] These platforms may support the translation of Orchidaceae-derived materials into topical applications; however, future studies should define primary endpoints clearly, report dose and exposure conditions in detail, and incorporate standardized evaluation of local tolerability, including irritation and sensitization.

Safety Reporting and Standardization

Although safety-related terms were included in the search strategy, they were not prominent in the MeSH structure. This pattern likely reflects both incomplete reporting and incomplete indexing, because irritation or tolerability outcomes may be assessed but not described in titles, abstracts, or MeSH terms. For topical and cosmeceutical development, however, systematic safety evaluation is essential. At a minimum, studies should include irritation and sensitization testing, and phototoxicity when relevant, together with basic quality control measures such as contaminant screening and batch consistency.

Within the exported PubMed dataset (n=103), explicit safety-related wording was relatively uncommon: skin irritation- and sensitization-related terms appeared in 8 and 5 records, respectively (title/abstract/MeSH), whereas toxicity-related terms appeared in 19 records and adverse-event or tolerability terms in 26. Notably, the specific MeSH term "Skin Irritation" was not identified in these records, underscoring the heterogeneity of local tolerability reporting and indexing (Table 1).

Several features of the Dendrobium literature make standardization particularly important. Reviews focusing on Dendrobium leaves explicitly raise toxicological questions that extend beyond traditional-use narratives.[19] Broader pharmacology literature also highlights systemic bioactivity of Dendrobium-derived constituents, including hepatoprotective effects.[20] Variation across species, plant parts, and processing further complicates interpretation of efficacy and safety.[3,4,19] Therefore, botanical authentication and chemical standardization are prerequisites for interpreting both efficacy and safety. Frameworks such as component-compatibility theories in Chinese medicine may help generate hypotheses, but they still require quantitative evaluation of interactions and toxicity rather than post-hoc justification.[6]

Table 1 Evidence Map of Representative Orchidaceae/Dendrobium Studies with Dermatology Relevance and Safety Reporting

Dermatologic Indication/Application	Evidence Level	Botanical Material/ Formulation	Model/ Population	Key Endpoints/ Mechanistic Readouts	Safety Reporting
Atopic dermatitis-like inflammation[14,15]	Animal (mouse)	Dendrobium nobile/ officinale polysaccharides	DNCB/DNFB-induced dermatitis models	Lesion severity; IgE/ cytokines; barrier proteins; MAPK/NF-κB/ STAT3 signaling	Local tolerability was not assessed
Photoaging/oxidative stress[11]	In vitro (fibroblasts)	Dendrobium nobile polysaccharides	UVA-exposed dermal fibroblasts	Senescence-associated changes; MMPs; JNK/c-Jun signaling	Cytotoxicity was sometimes reported; local irritation was not applicable
UVB photodamage/ photoaging[12]	Animal (mouse)	Dendrobium nobile polysaccharides	UVB-induced photodamage models	Oxidative stress enzymes; inflammatory mediators; MMP expression; histology	Irritation or sensitization endpoints were rarely reported
Cosmetic anti-aging/skin quality[13]	Human topical/ preclinical	Dendrobium officinale flower topical extracts	Topical application; oxidative stress-linked aging context	Skin-quality/aging parameters; oxidative stress markers	Patch-test or irritation data were limited
Acne vulgaris[17]	Preclinical/ formulation	Dendrobium polysaccharide-based microneedles (with actives)	Inflammatory acne models; antibacterial assays	Bacterial inhibition; inflammatory infiltration; local inflammation markers	Local reactions were described qualitatively; AE capture was uncommon
Wound repair, including diabetic wound[16,18]	Preclinical/ biomaterials	Dendrobium polysaccharide-based hydrogels/ionic hydrogels	Wound models; delivery/materials studies	Closure rate; angiogenesis; inflammatory modulation; material biocompatibility	Biocompatibility was reported; irritation or sensitization was rarely indexed
Moisturizing/barrier support[16]	Preclinical/ cosmetic science	Dendrobium polysaccharides (eg, supramolecular assemblies)	Skin hydration/ barrier models	Hydration performance; barrier-related readouts	Safety reporting was inconsistent

Note: Numbers in parentheses indicate representative references in the reference list.

Implications for Future Work

Taken together, the bibliometric and mechanistic findings suggest three priorities for future work. First, taxonomy and voucher information, together with composition data such as extraction or formulation parameters and chemical fingerprints, should be reported in sufficient detail to permit replication. Second, mechanistic assays should be linked to dermatology-relevant endpoints rather than presented in isolation. Third, studies moving toward human application should use prospective designs with predefined capture of adverse events and local tolerability outcomes. Progress in these areas would improve the interpretability of Orchidaceae-related dermatology research for clinicians and product developers.

Limitations

This analysis was limited to PubMed-indexed records and may underrepresent studies published in non-indexed journals or in databases with broader coverage. Because records were retrieved up to January 19, 2026, the 2026 publication count reflects partial-year output. The deliberately restrictive retrieval strategy improved topic specificity, but some relevant studies may have been missed if Orchidaceae/Dendrobium and skin-related outcomes were not explicitly described in title or abstract fields. Although affiliation strings were cleaned and standardized before network construction, residual

ambiguity in PubMed metadata may still affect institution- and country-level mapping in a minority of records. Finally, bibliometric indicators reflect research activity and thematic emphasis rather than clinical efficacy or safety; questions of therapeutic value still require controlled clinical studies.

Conclusion

Between 2006 and early 2026, PubMed-indexed research linking Dendrobium and Orchidaceae plants to dermatology expanded substantially, with a marked increase in 2024–2025 and a strong contribution from China. The field is moving from constituent description toward mechanism-based studies of oxidative stress, inflammatory pathways, wound repair, and formulation development. However, clinically oriented evidence remains limited. Future research should strengthen botanical authentication and compositional characterization, incorporate dermatology-relevant endpoints, and systematically report local tolerability and adverse events to support more reliable clinical and cosmetic translation.

Ethics Statement

This bibliometric analysis used publicly available bibliographic records and did not involve human participants or identifiable personal data; therefore, ethical approval was not required.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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