

Review

Selected Edible Plant Species Occurring in and Utilized Throughout Cabo Verde as Sources of Dermatologically Relevant Compounds: An Ethnobotanically Grounded Review of Preclinical and Clinical Evidence

Izabela Bielecka ^{1,2}, Katarzyna Dos Santos Szewczyk ^{2,*}, Arlindo Rodrigues Fortes ^{3,4} and Katarzyna Klimek ^{5,*}

¹ Doctoral School, Medical University of Lublin, Chodźki 7 Street, 20-093 Lublin, Poland

² Department of Pharmaceutical Botany, Medical University of Lublin, Chodźki 1, 20-093 Lublin, Poland

³ Escola Superior de Ciências Agrárias e Ambientais, Universidade de Cabo Verde, Praia 7943-010, Santiago, Cape Verde

⁴ Linking Landscape, Environment, Agriculture and Food (LEAF), Instituto Superior de Agronomia, Universidade de Lisboa, 1349-017 Lisboa, Portugal

⁵ Department of Biochemistry and Biotechnology, Medical University of Lublin, 20-093 Lublin, Poland

* Correspondence: k.szewczyk@umlub.pl (K.D.S.S.); katarzyna.klimek@umlub.pl (K.K.); Tel.: +48-448-70-20 (K.K.)

Abstract

Skin diseases represent a growing global health challenge and continue to stimulate interest in safe, sustainable, and evidence-based dermatological interventions. In the present review, Cabo Verde is used as an ethnobotanical and biogeographical framework rather than as a source of strictly endemic dermatological plants. We focused on selected edible plant species occurring in and utilized throughout Cabo Verde, including native, naturalized, and cultivated taxa that are integrated into local food systems and traditional healthcare practices. Species were included only when they fulfilled the following criteria: a documented occurrence in Cabo Verde, recognized edible use, available phytochemical characterization, and at least one peer-reviewed study reporting dermatologically relevant biological activity. Literature identified through structured searches of PubMed, Scopus, and Web of Science were critically evaluated, with emphasis placed on phytochemistry, biological activity, safety considerations, evidence level, and translational relevance. The reviewed species, mainly from the genera *Psidium*, *Syzygium*, *Eugenia*, *Artocarpus*, *Ficus*, *Morus*, and *Passiflora*, have been associated with wound-healing, anti-inflammatory, antioxidant, antimicrobial, photoprotective, anti-aging, and skin-regenerative effects. Nevertheless, the available evidence remains dominated by in vitro and animal studies, whereas controlled human investigations are scarce. Accordingly, these species should be regarded as promising sources of dermatologically relevant compounds rather than as clinically validated dermatological therapies.

Keywords: wound healing; photoprotection; cutaneous inflammation; *Psidium cattleyanum*; *Passiflora edulis*; artocarpin; natural UV filters; Cabo Verde

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1. Introduction

Skin diseases constitute a major and growing global public health challenge. The World Health Organization (WHO) has recently identified dermatological disorders as a priority

area for global health action, encompassing infectious diseases, inflammatory and autoimmune disorders, chronic and rare dermatoses, skin malignancies, and environmentally driven skin conditions [1–3]. The WHO further emphasizes persistent inequalities in access to dermatological care, diagnostics, essential medicines, and wound-management resources, while recognizing ultraviolet (UV) radiation and climate change as emerging determinants of skin health [1–3]. Beyond their physical manifestations, skin disorders are frequently associated with substantial psychosocial, economic, and quality-of-life burdens, further highlighting the need for effective preventive and therapeutic strategies [1–3].

Against this background, naturally derived bioactive compounds are receiving increasing attention as sources of safe, effective, and sustainable dermatological interventions. Plant-derived products have historically contributed to the development of therapeutic agents, cosmetic ingredients, and functional foods and continue to provide valuable leads for modern drug discovery [4–7]. Edible plants are particularly attractive as sources of dermatologically relevant bioactive compounds because their long history of human consumption provides valuable information regarding oral exposure and may facilitate the initial assessment of oral exposure and provide valuable background information for translational research. However, oral safety does not necessarily predict dermal tolerability. Plant-derived preparations intended for topical use may induce irritation, erythema, pruritus, allergic reactions, or photosensitivity depending on their phytochemical composition, concentration, formulation characteristics, and individual susceptibility. Consequently, the presumed safety associated with edible species should not be extrapolated directly to topical applications, and dedicated dermatological safety assessments, including irritation, sensitization, phototoxicity, and long-term tolerability studies, remain essential prior to clinical implementation [4–15].

Cabo Verde possesses a rich diversity of useful edible plant species, many of which have been traditionally utilized for both nutritional and medicinal purposes. The useful flora of the archipelago includes numerous representatives of the families Myrtaceae, Moraceae, and Passifloraceae, several of which are cultivated, naturalized, or commonly consumed throughout the islands. Representative taxa include *Psidium cattleianum*, *Psidium guajava*, *Syzygium jambos*, and *Eugenia uniflora* (Myrtaceae); *Artocarpus altilis*, *Artocarpus heterophyllus*, *Artocarpus integer*, *Ficus carica*, *Ficus sur*, *Ficus sycomorus*, *Ficus thonningii*, and *Morus nigra* (Moraceae), as well as *Passiflora edulis* and *Passiflora quadrangularis* (Passifloraceae) [16]. These species have long been valued as food resources and are also employed in traditional medicine for the management of inflammatory conditions, infections, metabolic disorders, and wound healing. Their dual nutritional and ethnomedicinal relevance makes them particularly attractive candidates for dermatological and cosmeceutical research.

Beyond its value as a source of edible plants, Cabo Verde represents a unique biogeographical and ethnobotanical hotspot in the Atlantic Ocean. The archipelago harbors a diverse medicinal flora shaped by geographic isolation, ecological heterogeneity, and centuries of human-mediated plant introductions associated with transatlantic trade routes and migration. Ethnobotanical studies conducted across the islands, particularly on Santiago, have documented extensive traditional use of both native and introduced plant species for the treatment of infectious, inflammatory, gastrointestinal, respiratory, and dermatological disorders. Surveys have shown that at least 24 indigenous species are employed in traditional medicine, while local markets continue to play a crucial role in the preservation and dissemination of medicinal plant knowledge. The coexistence of endemic, native, cultivated, and naturalized taxa, together with the persistence of plant-based healthcare practices, makes Cabo Verde an attractive reservoir for the discovery of novel bioactive compounds with pharmaceutical, nutraceutical, and cosmeceutical potential. Importantly, the selection of Cabo Verde as the geographical focus of this review is not based on plant endemism alone. Rather, it reflects the distinctive ethnobotanical context of the archipelago, where native, naturalized, and cultivated edible species have been incorporated into local food systems,

domestic medicine, and market-based healthcare practices over centuries. In this sense, Cabo Verde functions as an ethnobotanical model in which geographically widespread tropical plants acquire specific regional relevance through long-standing patterns of cultivation, use, and knowledge transmission. At the same time, the edible status of a plant should not be interpreted as evidence of dermatological safety or efficacy. A history of food use may provide contextual information on oral exposure, but it does not predict dermal tolerability, irritation potential, sensitization risk, phototoxicity, or clinical benefit after topical application. Therefore, all dermatological claims discussed in this review should be interpreted in light of the actual level of evidence supporting them [15,17–20]. Thus, Cabo Verde serves not merely as a geographical setting but as an ethnobotanical model in which long-standing traditional knowledge can be critically evaluated using contemporary phytochemical, pharmacological, and dermatological evidence.

An important consideration when evaluating edible plants for dermatological applications is the distinction between food safety and topical safety. Although many of the species discussed in this review are widely consumed as foods and have a long history of traditional use, their safety profiles following dermal application cannot be assumed. Systematic reviews and evidence-based assessments of botanical products used in dermatology generally report a low incidence of serious adverse events; nevertheless, mild-to-moderate adverse reactions, including skin irritation, erythema, burning sensation, desquamation, pruritus, allergic contact dermatitis, and photosensitivity, have been documented for various plant-derived preparations. Furthermore, the risk of adverse cutaneous reactions may depend on extraction procedures, phytochemical composition, concentration, formulation type, duration of exposure, and individual susceptibility. Therefore, safety assessment should be regarded as a critical component of future translational research, alongside phytochemical standardization, efficacy evaluation, and mechanistic characterization [12–15]. Accordingly, the edible status of a plant should be regarded as supportive contextual information rather than evidence of topical safety or dermatological efficacy.

From a dermatological perspective, these plants are especially promising because they combine several classes of biologically active metabolites. Polyphenols, including flavonoids, phenolic acids, anthocyanins, tannins, prenylated flavonoids, and related compounds, exhibit potent antioxidant and anti-inflammatory activities and may regulate molecular pathways involved in photoaging, pigmentation disorders, collagen degradation, and skin carcinogenesis [4,8–11,21–23]. Several species, including *Psidium cattleianum*, *P. guajava*, *Syzygium jambos*, *Eugenia uniflora*, *Artocarpus* spp., and *Ficus carica*, have been reported to possess a high phenolic content and strong radical-scavenging capacity [4,8,9,11,21–25]. In addition, terpenoids, triterpenoids, and essential oil constituents identified in members of these genera display antimicrobial, anti-inflammatory, and enzyme-modulating properties that may be relevant to acne, wound healing, and inflammatory skin disorders [22,26–30]. Fatty acids and other lipophilic constituents occurring in fruits, seeds, and leaves may further contribute to epidermal barrier maintenance and support the development of topical formulations with enhanced dermatological functionality [31–33].

Recent studies have increasingly demonstrated the dermatological relevance of individual species occurring in Cabo Verde. Extracts of *Psidium guajava* have shown antioxidant, photoprotective, anti-inflammatory, and antimicrobial activities [8,9,34], whereas *P. cattleianum* has recently been highlighted as a promising source of compounds for skin-related applications [4]. Similarly, *Syzygium jambos* and *Eugenia uniflora* possess well-documented antioxidant, antimicrobial, and anti-inflammatory properties associated with their rich polyphenolic composition [22,27–30,35–38]. Within the Moraceae family, species of the genus *Artocarpus* are notable sources of prenylated flavonoids and related metabolites exhibiting anti-inflammatory, antioxidant, depigmenting, and wound-healing potential [28,38–42]. Likewise, *Ficus carica* and related *Ficus* species contain diverse bioactive constituents, in-

cluding phenolic compounds, coumarins, fatty acids, and prenylated isoflavones, many of which have demonstrated antioxidant, antimicrobial, anti-inflammatory, and regenerative activities relevant to skin health [31–33,43–47]. Emerging evidence also supports the dermatological potential of *Passiflora* species through antioxidant, photoprotective, anti-aging, and extracellular matrix-protective mechanisms.

Despite growing interest in these taxa, the available evidence remains fragmented across phytochemical, pharmacological, cosmetic, and ethnobotanical studies. To date, no comprehensive review has critically synthesized the dermatological potential of edible plant species occurring in and utilized throughout Cabo Verde. Therefore, the present review aims to evaluate these species as sources of dermatologically relevant bioactive compounds, with particular emphasis placed on phytochemistry, wound healing, photoprotection, anti-inflammatory activity, skin aging, and related mechanisms. By integrating ethnobotanical knowledge with contemporary phytochemical and pharmacological evidence, this review seeks to provide a scientific basis for future translational research and the development of novel plant-derived dermatological and cosmeceutical products.

2. Methodology: Species Selection, Literature Search and Eligibility Criteria

This review was conducted as a structured narrative synthesis informed by the PRISMA 2020 framework for transparent and reproducible reporting of literature searches [48]. The objective was to evaluate selected edible plant species occurring in Cabo Verde as potential sources of dermatologically relevant bioactive compounds.

Species were included only if they fulfilled all of the following predefined inclusion criteria: (i) documented occurrence in Cabo Verde as native, naturalized, cultivated, or commonly consumed edible plants; (ii) recognized edible use within the archipelago; (iii) available phytochemical characterization; and (iv) at least one peer-reviewed study reporting dermatologically relevant biological activity, such as antioxidant, anti-inflammatory, antimicrobial, wound-healing, photoprotective, depigmenting, anti-aging, or skin-regenerative effects. The review was not intended to catalog all edible plants of Cabo Verde; rather, it focused on the subset for which sufficient phytochemical and dermatology-relevant evidence was available to support critical analysis. Species selection was cross-checked against floristic and ethnobotanical sources for the useful flora of Cabo Verde. Species selection was verified using floristic and ethnobotanical references describing the useful flora of Cabo Verde, particularly the works of [15,16,19].

Literature searches were performed using PubMed, Scopus, and Web of Science Core Collection databases. Publications from January 2006 to March 2026 were preferentially included, although earlier papers were retained when they represented seminal contributions or the only direct evidence for a given dermatological endpoint. Search strings combined botanical names with dermatology-related terms in English and Portuguese. Representative syntax was as follows: ("*Psidium guajava*" OR goiabeira) AND (skin OR wound healing OR dermatitis OR photoprotection OR UV OR inflammation OR collagenase OR elastase OR tyrosinase OR acne). Equivalent strings were applied to the remaining selected species. Additional searches incorporated Cabo Verde-related terms, including "Cabo Verde", "Cape Verde", "flora útil", "plantas comestíveis", "cicatrização", "fotoproteção", "inflamação cutânea", and "maracujá". Reference lists of eligible studies and regional floristic sources were also screened. Google Scholar was used only as a supplementary tool to identify potentially relevant peer-reviewed publications not captured in the primary databases.

Eligible studies reported original data on extracts, fractions, isolated compounds, formulations, or preparations derived from the selected species and evaluated them in dermatologically relevant models. Eligible endpoints included wound healing,

photoprotection, anti-inflammatory activity, skin-relevant antimicrobial effects, inhibition of tyrosinase, collagenase, elastase, or hyaluronidase, antioxidant effects relevant to skin biology, skin-barrier protection, keratinocyte- or fibroblast-based assays, UV-induced skin-damage models, formulation studies, and human investigations. Studies focused exclusively on agricultural, nutritional, food-processing, technological, or ecological topics without direct relevance to skin health were excluded. Conference abstracts, editorials, letters, patents, and records lacking sufficient methodological information were also excluded.

The study-selection process followed four PRISMA stages: identification, screening, eligibility assessment, and inclusion. Database searching identified 16,105 records (PubMed, 397; Scopus, 8756; Web of Science, 6952). After duplicate removal, 14,329 unique records remained for title and abstract screening. During this stage, 8542 records were excluded because they were outside the dermatological scope of the review, did not concern the selected edible species, contained no original data, or focused exclusively on non-cutaneous agricultural or nutritional aspects. The remaining records underwent an additional eligibility filtering step based on predefined inclusion criteria and publication type. During this step, records corresponding to reviews, conference abstracts, editorials, letters, non-original publications, and studies that clearly did not meet the predefined eligibility criteria were removed prior to full-text retrieval. Consequently, 596 full-text articles were assessed for eligibility. Of these, 436 were excluded because they lacked dermatologically relevant endpoints, lacked adequate phytochemical characterization, provided insufficient methodological detail, focused on non-cutaneous applications, or represented duplicate datasets. Ultimately, 160 studies were included in the qualitative synthesis.

Because the included studies were highly heterogeneous with respect to plant material, extraction procedures, phytochemical characterization, biological models, and outcome measures, quantitative meta-analysis was not considered appropriate. Evidence was therefore synthesized narratively with emphasis on phytochemical composition, biological activity, mechanistic plausibility, safety considerations, evidence tier, and translational relevance.

The literature selection process is summarized in the PRISMA flow diagram presented in Figure 1.

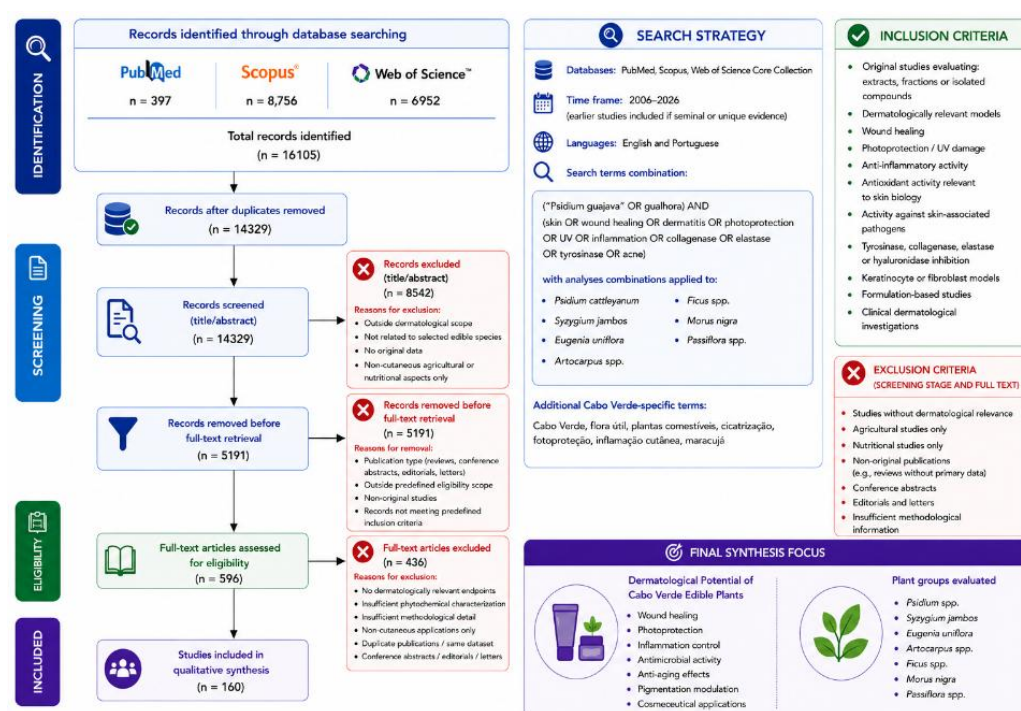


Figure 1. PRISMA flow diagram. Created in BioRender. Created in BioRender. Klimek, K. (2026) <https://BioRender.com/yvin9rx> (accessed on 13 June 2026).

3. Relevance of the Selected Species to Cabo Verde

The species evaluated in this review fulfilled the predefined inclusion criteria described in Section 2 and were selected based on their documented occurrence within the useful flora of Cabo Verde. Importantly, the geographical focus of this review is not based on plant endemism, but on the unique ethnobotanical context of the archipelago, where native, naturalized, cultivated, and long-established edible species have been integrated into traditional food systems and healthcare practices over centuries. Cabo Verde therefore provides a distinctive regional framework for evaluating plants that combine ethnobotanical relevance with emerging scientific evidence supporting dermatological applications [49]. The present review does not include all edible plant species occurring in Cabo Verde. Instead, it focuses on species that satisfy predefined scientific criteria, namely documented occurrence within the archipelago, recognized edible use, available phytochemical characterization, and published evidence indicating biological activities relevant to skin health. Consequently, the selected taxa represent the subset of Cabo Verde edible flora for which sufficient experimental evidence currently exists to support a critical evaluation of their dermatological potential. These include representatives of the Myrtaceae (*Eugenia uniflora* L., *Psidium cattleianum* Sabine, *Psidium guajava* L., *Syzygium jambos* (L.) Alston), Moraceae (*Artocarpus altilis* (Parkinson) Fosberg, *Artocarpus heterophyllus* Lam., *Artocarpus integer* (Thunb.) Merr., *Ficus carica* L., *Ficus sur* Forssk., *Ficus sycomorus* L., *Ficus thonningii* Blume, *Morus nigra* L.), and Passifloraceae (*Passiflora edulis* Sims, *Passiflora quadrangularis* L.) families. Owing to their established use as edible and medicinal plants and the growing body of evidence supporting their biological activities, these species constitute a relevant framework for exploring the dermatological potential of Cabo Verdean plant resources.

In addition to their botanical and pharmacological relevance, many of the species evaluated in this review are widely recognized in Cabo Verde under traditional Portuguese or vernacular names. Inclusion of local names facilitates linkage between scientific literature, ethnobotanical knowledge, agricultural practice, and community use, thereby supporting the cultural and practical context of future dermatological applications. Table 1 summarizes the most commonly reported local names associated with the edible plant species discussed in this review.

Table 1. Scientific names, commonly used local names, and principal edible parts of the evaluated plant species occurring in Cabo Verde [15,16,49].

Scientific Name	Common Local Name(s)	Main Edible Part(s)
<i>Psidium cattleianum</i> Sabine	araçá; goiavinha	Fruits
<i>Psidium guajava</i> L.	goiabeira; goiaba	Fruits, leaves (traditional infusions)
<i>Syzygium jambos</i> (L.) Alston	jamboeiro; jambre	Fruits
<i>Eugenia uniflora</i> L.	pitangueira; pitanga	Fruits
<i>Artocarpus altilis</i> (Parkinson) Fosberg	fruta-pão	Fruits (starchy syncarp), seeds
<i>Artocarpus heterophyllus</i> Lam.	jaqueira	Fruits, seeds
<i>Artocarpus integer</i> (Thunb.) Merr.	jaqueira	Fruits, seeds

<i>Ficus carica</i> L.	figueira; figueira-de-Portugal; figo	Fruits
<i>Ficus sur</i> Forssk.	figueira; figueira-brava; figueira-preta	Fruits
<i>Ficus sycomorus</i> L.	figueira-branca; figueira-brava; figueira-de-figos-grandes	Fruits
<i>Ficus thonningii</i> Blume	figueira	Fruits
<i>Morus nigra</i> L.	amoreira; morreira; amora	Fruits
<i>Passiflora edulis</i> Sims	maracujá-pequeno	Fruits, seeds
<i>Passiflora quadrangularis</i> L.	maracujá-grande	Fruits

Accordingly, the selected species should be regarded as representative examples of the dermatologically and most extensively investigated edible plants occurring in Cabo Verde rather than as a complete inventory of the archipelago's edible flora.

4. Comparative Assessment of Dermatological Activities

To avoid conflating fundamentally different levels of evidence, Table 2 should be interpreted as a map of research maturity rather than a comparative ranking of dermatological efficacy. In this table, biochemical or enzyme-based assays indicate preliminary mechanistic signals, cell-based assays indicate preclinical biological plausibility, animal studies indicate stronger preclinical support, and formulation or clinical studies indicate the highest currently available translational relevance. Accordingly, the symbols summarize the highest level of supporting evidence identified for each activity domain and should not be interpreted as equivalent effect size across species.

Table 2. Comparative overview of dermatologically relevant evidence for selected edible plant species occurring in Cabo Verde, harmonized by highest Evidence Tier reached.

Species	Main Dermatological Signal	Highest Evidence Tier Reached	Best-Supported Endpoint(s)	Translational Interpretation	Key References
<i>Psidium cattleianum</i>	Antioxidant, anti-aging, skin-relevant antimicrobial activity	Tier 2	Antioxidant and enzyme-related skin-relevant signals; limited formulation support	Early preclinical candidate	[4,9,50]
<i>Psidium guajava</i>	Atopic dermatitis-related anti-inflammatory activity; photoprotection	Tier 3	DNCB/NC-Nga dermatitis model; keratinocyte mechanistic studies	Advanced preclinical, disease-oriented support	[8,10,34]
<i>Syzygium jambos</i>	Anti-acne, antimicrobial, anti-aging/enzyme inhibition	Tier 2	<i>Cutibacterium acnes</i> assays; enzyme inhibition; stressed keratinocytes	Mechanistically strong preclinical candidate	[5,21,26,51]
<i>Eugenia uniflora</i>	Antioxidant, anti-inflammatory, topical-delivery feasibility	Tier 2	Polyphenol-rich antioxidant and anti-inflammatory studies	Early preclinical candidate	[11,25,29,36]
<i>Artocarpus alt-lis/artocarpin-rich preparations</i>	Wound healing, photoprotection, barrier support	Tier 3	Wound-healing and UV-damage animal models; cell-based support	Advanced preclinical candidate	[7,39–41,52]
<i>Artocarpus heterophyllus</i>	Anti-inflammatory, depigmenting, anti-tyrosinase potential	Tier 2	Tyrosinase-related and anti-inflammatory preclinical endpoints	Early preclinical candidate	[42,53,54]
<i>Artocarpus integer</i>	Tyrosinase inhibition, antimicrobial potential	Tier 1	Discovery-stage phytochemical and biochemical evidence	Exploratory candidate	[55–57]
<i>Ficus carica</i>	Wound healing, an-	Tier 3	Excisional wound and in-	Advanced	[30,31,43,45,47]

	ti-inflammatory activity		flammatory endpoints	preclinical candidate	
<i>Ficus sur</i>	Antioxi-dant/enzyme-related signal	Tier 1	Indirect mechanistic evidence only	Exploratory candidate	[6,58]
<i>Ficus sycomorus</i>	Anti-inflammatory potential	Tier 3	In vivo anti-inflammatory support, but indirect dermatological relevance	Early preclinical, indirect	[6,59]
<i>Ficus thonningii</i>	Infected wound care, antimicrobial wound support	Tier 3	Rat wound model and anti-bacterial assays	Preclinical proof-of-concept	[6,60]
<i>Morus nigra</i>	Depigmenting, anti-aging, antioxidant activity	Tier 2	Tyrosinase-related and anti-oxidant mechanistic support	Mechanistically promising preclinical candidate	[61–64]
<i>Passiflora edulis</i>	Photoprotection, anti-photoaging, wound-related support	Tier 4	Formulation studies, patch testing, preliminary human study	Early translational candidate	[65–68]
<i>Passiflora quadrangularis</i>	Antioxi-dant/anti-inflammatory potential	Tier 1	Hypothesis-generating evidence only	Exploratory candidate	[69,70]

Tier 1 = biochemical, enzymatic, microbiological, antioxidant, UV/SPF, or formulation studies; Tier 2 = cell-based or ex vivo skin-relevant studies; Tier 3 = dermatology-relevant in vivo animal models; Tier 4 = human tolerability, patch-testing, or proof-of-concept clinical studies; DNCB, 2,4-dinitrochlorobenzene; NC-Nga mice, murine model commonly used for atopic dermatitis.

Biochemical/enzyme evidence includes antioxidant, antimicrobial, tyrosinase, collagenase, elastase, hyaluronidase, and related mechanistic assays. Cell/ex vivo evidence includes keratinocyte-, fibroblast-, endothelial-, skin-equivalent-, or UV-stressed skin-cell models. In vivo animal evidence was counted when the endpoint is dermatologically relevant. Formulation evidence includes topical vehicle development, stability studies, SPF-enhancement studies, and related product-level experiments. Human topical/clinical evidence includes patch tests, tolerability studies, open-label proof-of-concept studies, or controlled clinical trials. This table is intended to show where evidence exists, not to rank efficacy across species.

Although the reviewed species differ taxonomically, they share several classes of compounds that are repeatedly associated with dermatologically relevant biological activities. These metabolites constitute the principal mechanistic basis for the antioxidant, anti-inflammatory, antimicrobial, wound-healing, photoprotective, depigmenting, and anti-aging properties discussed throughout this review. Figure 2 summarizes representative bioactive constituents identified in the edible plant species occurring in Cabo Verde together with their principal dermatological relevance.

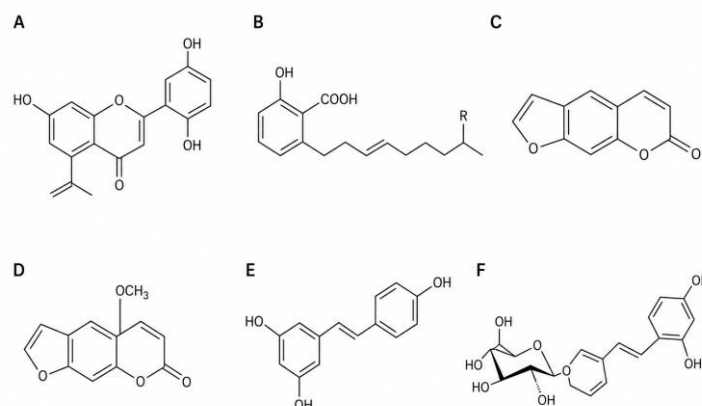


Figure 2. Representative dermatologically relevant phytochemicals identified in edible plant species occurring in Cabo Verde. **(A)** Artocarpin from *Artocarpus* spp., associated with wound-healing and photoprotective effects. **(B)** An anacardic acid derivative from *Syzygium jambos*, associated with anti-acne and antimicrobial activity. **(C)** Psoralen and **(D)** bergapten from *Ficus carica*, included as representative phototoxic furanocoumarins. **(E)** Oxyresveratrol and **(F)** mulberroside A from *Morus nigra*, associated with tyrosinase inhibition and depigmenting potential. The structures are shown to illustrate key molecular scaffolds linking phytochemistry, dermatological bioactivity, and safety considerations; R = C₁₅H₃₁.

The compounds were selected as representative examples of structurally distinct phytochemicals linked to the major dermatological activity domains discussed in this review, while also illustrating relevant safety considerations such as phototoxic furanocoumarins.

5. Comparative Evaluation of Dermatological Evidence Across the Selected Species

The studies included in this section differ substantially in terms of experimental design, biological model, phytochemical characterization, formulation development, and translational maturity. Therefore, Table 3 was designed not as a ranking of efficacy, but as a structured comparison of representative primary studies according to the highest level of evidence currently available for each preparation or compound. This approach allows biochemical, cell-based, animal, formulation, and human data to be interpreted within clearly defined evidence tiers rather than treated as equivalent forms of support.

Preference was given to studies that provided sufficient methodological detail and direct dermatological relevance, including wound healing, photoprotection, anti-inflammatory activity, anti-acne activity, skin-aging modulation, barrier-related endpoints, formulation performance, or human tolerability. When available, information on dose or concentration, experimental model, principal outcome, translational relevance, and key limitations were included. Importantly, inclusion of a study in Table 3 does not imply confirmed clinical efficacy; rather, it identifies the most informative evidence currently available for assessing translational potential.

Overall, Table 3 indicates that the strongest translational evidence is currently available for *Passiflora edulis*, for which formulation studies, human patch-testing, and preliminary clinical observations have been reported. Artocarpin-rich *Artocarpus* preparations, *Psidium guajava*, *Ficus carica*, and *Ficus thonningii* are supported mainly by advanced preclinical evidence, including animal models relevant to wound healing, inflammation control, or photoprotection. By contrast, *Syzygium jambos*, *Eugenia uniflora*, and several additional taxa currently remain supported mainly by biochemical and cell-based studies, although these still provide useful mechanistic signals.

The table also highlights important limitations of the current evidence base. Many studies remain preclinical, several do not report complete dose information, and most lack dedicated dermal safety, phototoxicity, skin-delivery, or long-term tolerability data. Consequently, the evidence summarized in Table 3 should be interpreted as a comparative overview of research maturity and translational readiness rather than as proof of therapeutic or cosmetic efficacy.

Another important consideration is the interpretation of safety. Although the edible status of the reviewed species may provide useful background information regarding oral exposure, it should not be regarded as evidence of safety for topical dermatological application. Cutaneous exposure involves different absorption pathways and may be associated with irritation, sensitization, allergic reactions, phototoxicity, or formulation-dependent adverse effects. Therefore, future studies should prioritize standardized phytochemical characterization, formulation optimization, dermal irritation and sensitization testing, phototoxicity assessment where relevant, and well-designed human studies before these plant-derived preparations can be considered evidence-based dermatological or cosmeceutical candidates.

Table 3. Representative primary studies supporting the dermatological potential of selected edible plant species occurring in Cabo Verde, standardized by evidence tier and translational relevance.

Species	Preparation	Dermatological Indication	Model	Dose/Concentration	Key Outcome	Evidence Tier	Translational Relevance	Main Limitation	References
Artocarpin-rich <i>Artocarpus</i> preparation	Isolated artocarpin	Wound healing	C57BL/6 excisional wound model plus fibroblast, keratinocyte, and endothelial assays	Not reported	Faster wound closure; improved collagen deposition, re-epithelialization, and angiogenesis	Tier 3, supported by Tier 2	Advanced preclinical	Rodent wound healing is not equivalent to human healing; dose incompletely reported	[52]
Artocarpin-rich <i>Artocarpus</i> preparation	Topical artocarpin formulation	Photoprotection/anti-photoaging	UVB-induced skin damage in hairless mice	0.05–0.1% topical	Reduced epidermal thickening, ROS, lipid peroxidation, TNF- α , and IL-1 β	Tier 3 animal	Advanced preclinical	No human data; nonlinear dose–response reported	[71]
<i>Artocarpus altilis</i>	Methanolic heartwood extract	Anti-inflammatory/anti-pollution/anti-aging	Particulate matter-exposed HaCaT keratinocytes	5 μ g/mL	Reduced ROS, 4-HNE, TNF- α , TNFR1, and COX-2; improved AQP3, FLG, and LOR	Tier 2 cell-based	Mechanistic support	Requires formulation optimization and human validation	[72]
<i>Psidium guajava</i>	Water-extract cream	Atopic dermatitis-like inflammation	NC/Nga mice with DNCB-induced lesions	Not reported	Reduced lesion severity, IgE, TARC, TNF- α , and IL-4; increased IL-10	Tier 3 animal	Advanced preclinical disease-oriented evidence	No dedicated dermal safety assessment reported	[73]
<i>Psidium guajava</i>	Ethyl-acetate extract	Atopic dermatitis-related inflammation	Cytokine-stimulated HaCaT keratinocytes	Not reported	Reduced TARC/CCL17 expression via HO-1, NF- κ B, and STAT1 modulation	Tier 2 cell-based	Mechanistic support for the in vivo dermatitis model	Cell model only	[74]
<i>Syzygium jambos</i>	Ethanol leaf extract and isolated ana-	Anti-acne/antimicrobial/anti-inflammatory signal	<i>Cutibacterium acnes</i> antibacterial assays and inflammatory	Extract MIC 31.3 μ g/mL; active analog MIC 7.9	Anti-acne signal with identification of active	Tier 2/Tier 1	Mechanistically strong discovery-to-preclinical	No skin-delivery, formulation, or	[51]

cardic-acid derivative			models	µg/mL	metabolites		signal	tolerability data	
<i>Syzygium jambos</i>	Aqueous leaf extract	Anti-aging/photostress protection	Enzyme assays plus UVA-stressed HaCaT cells	Not reported	Inhibited tyrosinase, collagenase, elastase, and hyaluronidase; reduced oxidative stress	Tier 2/Tier 1	Mechanistic support	No in vivo or human validation	[75]
<i>Ficus carica</i>	5% leaf-extract cream	Wound healing/anti-inflammatory activity	Wistar rat excisional wound model with histology, qPCR, immunohistochemistry	5% cream	Improved collagen deposition, angiogenesis, and re-epithelialization; reduced IL-1β, IL-6, and TNF-α	Tier 3 animal	Advanced preclinical	Phototoxicity risk of furanocoumarins not directly addressed	[76]
<i>Ficus thonningii</i>	Ethyl-acetate leaf-extract ointment	Infected wound care/antimicrobial wound support	Rat wound model plus antibacterial assays	5–7.5% ointment	Better wound-associated bacterial control and improved healing	Tier 3 animal	Preclinical proof-of-concept	Limited safety and tolerability information	[60]
<i>Passiflora edulis</i>	Hydroalcoholic leaf extract	Wound healing	Rat dorsal wound model	Daily topical application	Increased fibroblast proliferation and collagen deposition, but no faster wound closure	Tier 3 animal	Preclinical proof-of-concept	Histological improvement did not clearly translate into faster macroscopic closure	[77]
<i>Passiflora edulis</i>	Seed extract in sunscreen formulations	Photoprotection/irritation screening	Formulation testing plus human patch test	0.1–0.3% extract	Increased SPF and UVA-protection; non-irritating in volunteers	Tier 4 human tolerability + formulation	Early translational support for cosmetic development	Short-term safety only; no efficacy trial	[78]
<i>Passiflora edulis</i>	Seed extract cream	Anti-aging/photoaging	Open-label pre-experimental clinical study (n = 40)	3% cream for 8 weeks	Reduced dermoscopic photoaging score; high user satisfaction	Tier 4 human proof-of-concept	Early translational support	Non-randomized; no comparator group	[79]
<i>Passiflora edulis</i>	Phenolic-rich peel extract incorporated into cream	Photoprotection/natural UV-filter	In vitro SPF, antioxidant and formulation stability assays	0.2 mg/mL extract	Increased in vitro SPF, antioxidant capacity and acceptable for-	Tier 1	Supports the feasibility of developing multifunctional photoprotective cosmetic	No skin-cell, animal or clinical validation	[80]

formulations	mulation stability	formulations
AQP3, aquaporin-3; CCL17, C-C motif chemokine ligand 17; COX-2, cyclooxygenase-2; DNCB, 2,4-dinitrochlorobenzene; FLG, filaggrin; 4-HNE, 4-hydroxynonenal; HO-1, heme oxygenase-1; IgE, immunoglobulin E; IL, interleukin; LOR, loricrin; MIC, minimum inhibitory concentration; NF-κB, nuclear factor kappa B; qPCR, quantitative polymerase chain reaction; ROS, reactive oxygen species; SPF, sun protection factor; STAT1, signal transducer and activator of transcription 1; TARC (CCL17), thymus and activation-regulated chemokine; TNF-α, tumor necrosis factor alpha; TNFR1, tumor necrosis factor receptor 1; UVA, ultraviolet A radiation; UVB, ultraviolet B radiation; HaCaT, immortalized human keratinocyte cell line; NC/Nga mice, murine model commonly used for atopic dermatitis; C57BL/6 mice, inbred mouse strain widely used in wound-healing studies; Wistar rats, laboratory rat strain; DNCB-induced lesions, experimental model of atopic dermatitis induced by 2,4-dinitrochloro benzene. Tier 1: biochemical, enzymatic, microbiological, antioxidant, or SPF-related assays without a living skin model; Tier 2: cell-based or ex vivo skin-relevant model; Tier 3: dermatology-relevant in vivo animal model; Tier 4: human tolerability or proof-of-concept study; Tier 5: randomized controlled clinical trial.		

6. Dermatological Potential of *Psidium* Species: From Phytochemistry to Translational Applications

Among the Myrtaceae species documented in the useful flora of Cabo Verde, *Psidium cattleianum* Sabine (strawberry guava) and *Psidium guajava* L. (guava) emerge as particularly promising sources of dermatologically relevant bioactive compounds. Both species are characterized by a rich phytochemical composition dominated by phenolic acids, flavonoids, tannins, carotenoids, terpenoids, and other secondary metabolites with recognized antioxidant, antimicrobial, and anti-inflammatory activities. These properties are highly relevant to skin health because oxidative stress, microbial dysbiosis, chronic inflammation, and extracellular matrix degradation are central mechanisms underlying skin aging, wound healing disorders, acne, and inflammatory dermatoses [4,9,81,82].

6.1. *Psidium cattleianum*

Recent evidence has substantially strengthened the dermatological relevance of *P. cattleianum*. A dermatology-oriented study conducted on leaves collected in Cabo Verde demonstrated a multifunctional bioactivity profile encompassing antioxidant, antimicrobial, and anti-aging activities, together with successful incorporation of the extract into a topical cream formulation that remained physicochemically stable for at least 90 days. The extract also displayed interactions with selected antibiotics, with both synergistic and antagonistic effects depending on the combination tested, highlighting the importance of considering phytochemical–drug interactions in future applications [4].

Phytochemical investigations revealed a complex composition rich in phenolic acids, including gallic acid and ellagic acid derivatives, flavonoid glycosides, tannins, carotenoids, and terpenoid constituents. Fruit extracts additionally contain epicatechin gallate and carotenoids such as lutein, antheraxanthin, and β -carotene, whereas stem bark extracts are characterized by tannins, flavonoids, saponins, and terpenoid/steroidal compounds [9,82,83]. Essential oils isolated from leaves and flowers are dominated by β -caryophyllene and α -caryophyllene and exhibit anti-inflammatory and antinociceptive properties [83]. Notably, the anti-inflammatory activity of the essential oil appears to depend strongly on plant organ and extraction method, emphasizing the importance of chemotype characterization and extract standardization [82].

Several biological activities reported for *P. cattleianum* are directly relevant to dermatology. Leaf and fruit extracts exhibit strong antioxidant activity through scavenging of reactive oxygen and nitrogen species, an effect largely attributed to their high polyphenol and carotenoid content [4,9]. Antimicrobial activity has been demonstrated against a range of microorganisms, including skin-associated pathogens such as *Staphylococcus aureus* and *Cutibacterium acnes* [4,81]. Moreover, leaf extracts inhibit collagenase, elastase, and tyrosinase, enzymes critically involved in wrinkle formation, loss of skin elasticity, and hyperpigmentation [4]. These findings collectively support the potential application of *P. cattleianum* as a multifunctional cosmetic or dermatological ingredient targeting both skin aging and microbial skin disorders.

Additional evidence from animal studies indicates that hydroalcoholic stem bark extracts possess significant analgesic and anti-inflammatory properties, likely mediated by tannins and flavonoids [9]. Antimicrobial effects have also been observed against oral and cutaneous bacteria, with reported minimum inhibitory concentrations in the low hundreds of micrograms per milliliter [9]. Long-term oral administration of fruit preparations in mice did not produce detectable toxicity, further supporting the favorable safety profile traditionally associated with this edible species [82]. Nevertheless, despite

encouraging preclinical evidence, dermatological applications remain limited by the absence of controlled human studies and comprehensive topical safety assessments.

6.2. *Psidium guajava*

Compared with *P. cattleyanum*, *P. guajava* benefits from a broader body of pharmacological and translational evidence. The species contains a diverse array of phytochemicals, including flavonoids (particularly quercetin and avicularin), phenolic acids such as gallic, ferulic, catechin, and syringic acid derivatives, terpenoids, triterpenes, carotenoids, saponins, alkaloids, and vitamin C [8,83–85]. These compounds contribute to the well-documented antioxidant, antimicrobial, anti-inflammatory, antidiabetic, hepatoprotective, and cytoprotective activities of guava extracts [8,34,83–85].

The strongest dermatological evidence for *P. guajava* originates from studies addressing inflammatory skin diseases. In a murine model of atopic dermatitis-like lesions induced by 2,4-dinitrochlorobenzene (DNCB), topical administration of a water-extract cream significantly reduced lesion severity and decreased serum IgE levels, as well as inflammatory mediators, including TNF- α , IL-4, and TARC, while simultaneously increasing the anti-inflammatory cytokine IL-10 [73]. Complementary mechanistic studies using HaCaT keratinocytes demonstrated suppression of pro-inflammatory chemokine production through modulation of NF- κ B- and STAT1-related pathways, providing mechanistic support for the observed in vivo effects [74]—these findings position *P. guajava* among the most promising edible plant species for the management of inflammatory dermatoses.

Beyond inflammation control, guava extracts display strong antioxidant activity capable of protecting cells against oxidative stress and DNA damage [34]. Antimicrobial effects have been reported against several bacterial species, while phenolic constituents contribute to anti-inflammatory responses and may support wound healing processes [8,34,85]. Of particular relevance to dermatological and cosmeceutical applications, phenolic-rich leaf extracts have demonstrated photoprotective properties and have been proposed as natural ingredients for sunscreen formulations, owing to their ability to enhance SPF values and reduce oxidative damage associated with ultraviolet exposure [8,85].

Taken together, the available evidence suggests that *P. cattleyanum* and *P. guajava* occupy distinct but complementary positions within the dermatological landscape. *P. cattleyanum* appears particularly attractive as a source of multifunctional anti-aging, antimicrobial, and cosmeceutical ingredients, whereas *P. guajava* is currently supported by stronger disease-oriented evidence, especially in relation to inflammatory skin disorders and photoprotection. Future translational progress will depend on improved extract standardization, topical pharmacokinetic characterization, dermal safety assessment, and well-designed clinical trials capable of validating the promising results obtained in experimental models.

Overall, the dermatological potential of *Psidium* species is supported by a substantial body of in vitro and animal studies, particularly for *P. guajava*. However, well-designed clinical investigations remain limited, and further human studies are required to confirm dermatological efficacy and safety.

In summary, the dermatological relevance of *Psidium* spp. is supported mainly by mechanistic and animal studies, whereas clinical efficacy and topical safety remain insufficiently validated.

7. Dermatological Potential of *Syzygium jambos* and *Eugenia uniflora*: Antimicrobial, Anti-Inflammatory, and Anti-Aging Perspectives

Among the Myrtaceae species documented in the useful flora of Cabo Verde, *Syzygium jambos* (rose apple) and *Eugenia uniflora* (pitanga, Surinam cherry) have emerged as promising sources of multifunctional phytochemicals with potential applications in dermatology and cosmeceuticals. Both species are characterized by a rich composition of phenolic compounds, flavonoids, tannins, terpenoids, alkaloids, and other secondary metabolites that collectively contribute to antioxidant, antimicrobial, and anti-inflammatory activities. Although much of the currently available evidence remains preclinical, these plants provide some of the strongest mechanistic support within the Myrtaceae family for applications related to acne management, skin aging, inflammation control, and topical formulations [21–23,26,27,51,75,86,87].

7.1. *Syzygium jambos*

The phytochemical profile of *S. jambos* is remarkably diverse and includes phenolic compounds, flavonoids, alkaloids, tannins, saponins, essential oils, alkylphenols, and pentacyclic triterpenoids. Quantitative analyses have revealed substantial concentrations of phenolics and flavonoids in both fruits and seeds, while chromatographic studies have identified compounds such as quercetin, rutin, jambosine, cardanols, alkylresorcinols, and triterpenoid derivatives belonging to the oleanane and ursane families [21,22,26,27].

From a dermatological perspective, the most compelling evidence relates to acne-associated antimicrobial activity. Ethanolic leaf extracts exhibited potent activity against *Cutibacterium acnes* (formerly *Propionibacterium acnes*), and bioassay-guided fractionation identified an anacardic acid analog as one of the principal active constituents. The isolated compound demonstrated a minimum inhibitory concentration (MIC) of 7.9 µg/mL, approaching the activity of tetracycline used as a positive control (MIC 3.1 µg/mL) [51]. This finding is particularly noteworthy given the growing interest in antibiotic-sparing strategies for acne management and the increasing prevalence of antimicrobial resistance. However, translation of these results into clinical practice will require additional studies addressing skin permeation, topical bioavailability, lesion-specific anti-inflammatory efficacy, resistance development, and dermal tolerability.

Beyond antimicrobial activity, *S. jambos* demonstrates considerable potential as an anti-aging and photoprotective ingredient. Aqueous leaf extracts have been shown to inhibit several enzymes involved in skin aging, including tyrosinase, collagenase, elastase, and hyaluronidase, while simultaneously attenuating UVA-induced oxidative stress in HaCaT keratinocytes. Molecular docking and molecular dynamics analyses further supported interactions with multiple enzymatic targets associated with extracellular matrix degradation and pigmentation processes [75]. Collectively, these findings suggest that *S. jambos* may function as a multitarget botanical ingredient capable of addressing both structural and pigmentary manifestations of skin aging.

The species also exhibits pronounced antioxidant activity attributable to its high phenolic and flavonoid contents. Methanolic and ethanolic extracts consistently demonstrate strong free-radical scavenging activity in multiple experimental systems [21–23]. Furthermore, antibacterial and antifungal activities have been reported for leaf and bark extracts, supporting a broader antimicrobial potential beyond acne-associated microorganisms [87]. Anti-inflammatory effects have been linked to modulation of signaling pathways associated with oxidative stress and metabolic inflammation, including IRS-2/AKT/GLUT4-related mechanisms identified in diabetic models [88]. Although these findings originate primarily from non-dermatological studies, they provide

mechanistic support for the anti-inflammatory potential of the species in cutaneous applications.

Additional interest arises from the isolation of pentacyclic triterpenoids demonstrating cytotoxic activity against carcinoma cell lines [27]. While these observations are currently distant from direct dermatological application, they further highlight the pharmacological versatility of *S. jambos*. Overall, the available evidence positions this species as one of the most promising Myrtaceae taxa for future development of anti-acne, anti-aging, and multifunctional cosmeceutical formulations. Nevertheless, future investigations should prioritize standardized extracts, validated skin models, dermal safety assessment, and clinical studies capable of substantiating the promising preclinical findings.

7.2. *Eugenia uniflora*

Compared with *S. jambos*, the dermatological evidence for *E. uniflora* is less disease-specific but supported by extensive phytochemical and pharmacological characterization. Phytochemical investigations have identified a broad spectrum of bioactive constituents, including phenolic compounds such as gallic acid, ellagic acid, and oenothain B; flavonoids, including myricitrin, quercetin, afzelin, and myricetin derivatives; as well as tannins, alkaloids, terpenoids, and essential oil components [25,29,36,89–93]. High-resolution chromatographic analyses, including HPLC-ESI-MS/MS, consistently demonstrate that polyphenols and flavonoids represent the dominant bioactive fraction and are largely responsible for the biological activities reported for this species [25,29,36,86,89–92].

The strongest support for dermatological relevance arises from studies demonstrating anti-inflammatory activity combined with advanced topical delivery approaches. Extracts of *E. uniflora* have shown significant anti-inflammatory effects in multiple experimental models, while phytochemical analyses consistently identify flavonoids and phenolic constituents as major contributors to these activities [29,86]. Particularly noteworthy is the development of film-forming topical systems incorporating leaf extracts, which provide a direct bridge between phytochemical characterization and dermatological application. Such formulations highlight the feasibility of translating botanical extracts into topical products suitable for the management of skin lesions and inflammatory skin conditions [86].

Antioxidant activity represents one of the major strengths of *E. uniflora*. Phenolic compounds, flavonoids, and tannins exhibit substantial radical-scavenging activity in DPPH, ORAC, and related assays, supporting their potential role in protecting skin cells from oxidative stress associated with photoaging and chronic inflammation [91,92]. In addition, several studies have demonstrated antibacterial and antifungal activities of extracts and essential oils against both Gram-positive and Gram-negative bacteria, as well as *Candida* species [94,95]. Essential oils rich in compounds such as curzerene, spathulenol, and selina-1,3,7(11)-trien-8-one further contribute to the antimicrobial profile of the species and may represent promising candidates for microbiome-oriented skincare applications [96].

Recent findings also suggest potential anti-aging properties. Seed extracts have demonstrated anti-elastase activity combined with antioxidant effects, indicating a capacity to modulate extracellular matrix degradation processes associated with wrinkle formation and loss of skin elasticity [38]. Together with the strong antioxidant potential of the species, these findings provide a mechanistic rationale for considering *E. uniflora* as a source of cosmeceutical ingredients targeting skin aging and oxidative damage.

Additional pharmacological activities, including antidiabetic, hepatoprotective, analgesic, and antifungal effects, have also been reported [38,97–99]. Although these prop-

erties are not directly dermatological, they further illustrate the broad biological activity associated with the species' rich phytochemical composition. Importantly, available toxicological studies suggest a favorable safety profile, with no significant genotoxicity or developmental toxicity observed in experimental models [89,100]. This safety record enhances the attractiveness of *E. uniflora* as a candidate for future dermatological and cosmeceutical development.

Taken together, *S. jambos* and *E. uniflora* represent complementary dermatological resources within the Myrtaceae family. *Syzygium jambos* currently provides the strongest evidence for anti-acne, anti-aging, and enzyme-targeted applications, whereas *Eugenia uniflora* is distinguished by robust antioxidant and anti-inflammatory activities combined with emerging topical formulation strategies. Both species illustrate how phytochemical diversity can translate into multiple dermatologically relevant mechanisms, while simultaneously highlighting the need for standardized extracts, dermal safety assessment, and clinical validation before widespread therapeutic or cosmeceutical implementation.

Current evidence for *Syzygium jambos* and *Eugenia uniflora* is derived predominantly from phytochemical, biochemical, and cell-based investigations. Although the available data indicate considerable dermatological potential, clinical validation is currently lacking. Overall, the dermatological promise of *S. jambos* and *E. uniflora* remains preclinical, and no robust clinical trial evidence is yet available to confirm efficacy in humans.

8. Dermatological Potential of *Artocarpus* Species: Prenylated Flavonoids as Multifunctional Modulators of Wound Repair, Pigmentation, and Skin Aging

Within the Moraceae family represented in the useful flora of Cabo Verde, species of the genus *Artocarpus* occupy a particularly important position, owing to their abundance of prenylated flavonoids, chalcones, aurones, xanthones, and related phenolic metabolites. Among these taxa, *Artocarpus altilis* (breadfruit), *A. heterophyllus* (jackfruit), and *A. integer* (chempedak) have attracted considerable attention as sources of biologically active compounds with antioxidant, anti-inflammatory, antimicrobial, depigmenting, and wound-healing properties. Collectively, the available evidence highlights the genus as one of the most promising plant groups for dermatological and cosmeceutical applications among the edible species occurring in Cabo Verde [39,52,72,101–109].

A central mechanistic theme linking the dermatological activities of *Artocarpus* species is the occurrence of prenylated phenolic compounds, particularly artocarpin and structurally related metabolites. These compounds exhibit broad biological activity against pathways involved in oxidative stress, chronic inflammation, extracellular matrix degradation, melanogenesis, and tissue regeneration. Consequently, *Artocarpus* species provide a coherent phytochemical framework through which multiple dermatological targets can be addressed simultaneously [41,52,102,108].

8.1. *Artocarpus altilis*

Among the evaluated taxa, *A. altilis* is supported by the strongest dermatological evidence. Phytochemical investigations have identified abundant flavonoids, phenolic compounds, terpenoids, tannins, alkaloids, saponins, prenylated aurones, and chalcones distributed throughout leaves, fruits, and heartwood [39,101–108]. Several of these compounds exhibit potent antioxidant and anti-inflammatory activities, while prenylated aurones and chalcones additionally inhibit tyrosinase, suggesting relevance to pigmentation disorders and cosmetic skin-lightening applications [102,108].

The most compelling dermatological evidence concerns artocarpin, a prenylated flavonoid isolated from heartwood extracts. Experimental studies have demonstrated

that topical artocarpin accelerates wound healing through enhancement of fibroblast and keratinocyte proliferation, stimulation of angiogenesis, promotion of collagen deposition, and acceleration of re-epithelialization. These effects were accompanied by modulation of signaling pathways involving TGF- β , MAPK (p38/JNK/ERK), and Akt, indicating a mechanistically well-defined wound-repair response [52].

Artocarpin has also demonstrated significant photoprotective activity in UVB-induced skin damage models. Topical formulations reduced epidermal hyperplasia, oxidative stress markers, lipid peroxidation, and pro-inflammatory cytokines such as TNF- α and IL-1 β while suppressing COX-2-related inflammatory signaling [52]. These findings position artocarpin among the most promising plant-derived compounds identified in the present review, as it combines wound-healing, anti-inflammatory, antioxidant, and photoprotective activities within a single mechanistic framework.

Additional support for dermatological relevance is provided by studies evaluating methanolic heartwood extracts of *A. altilis* in particulate matter-induced keratinocyte injury. Treatment reduced intracellular reactive oxygen species, inflammatory mediators, and lipid peroxidation products while restoring barrier-associated proteins, including filaggrin, loricrin, and aquaporin-3. Simultaneously, extracts normalized the matrix metalloproteinase/tissue inhibitor of metalloproteinase (MMP/TIMP) balance associated with premature skin aging [72]. These observations suggest that *A. altilis* may offer protective effects against both environmental pollution and photoaging through modulation of oxidative stress and inflammatory pathways.

Beyond dermatology, numerous studies have documented antioxidant, antimicrobial, antihyperglycemic, antihypertensive, anti-hyperuricemic, and gastroprotective properties of *A. altilis* extracts [39,103–109]. Although these activities are not directly skin-related, they reinforce the broad pharmacological relevance of the species and support continued investigation of its bioactive constituents.

8.2. *Artocarpus heterophyllus*

Compared with *A. altilis*, evidence directly linking *A. heterophyllus* to validated dermatological endpoints remains more limited. Nevertheless, the species contains a diverse array of bioactive constituents, including flavonoids, phenolics, terpenoids, steroids, glycosides, tannins, and prenylated compounds with recognized dermatological relevance [42,53,110–117].

Particular attention has been devoted to artocarpin, which exhibits antioxidant, anti-inflammatory, antimicrobial, and anti-tyrosinase activities in addition to its well-documented anticancer properties [42,110,118]. Likewise, moracin C suppresses nitric oxide production, reactive oxygen species generation, and inflammatory signaling through modulation of MAPK and NF- κ B pathways [53]. Other prenylated flavones and coumarins, including artoheteronin and artonin E, demonstrate anti-inflammatory activity through inhibition of nitric oxide synthesis and related inflammatory mediators [111,112].

The relevance of these findings to dermatology stems primarily from mechanisms rather than disease-specific models. Antioxidant activity, suppression of inflammatory signaling, and inhibition of tyrosinase collectively suggest potential utility in photoaging, inflammatory dermatoses, and pigmentation disorders [53,111–121]. However, direct evidence from wound-healing models, skin-equivalent systems, or clinical studies remains insufficient. Therefore, dermatological applications of *A. heterophyllus* should currently be regarded as promising but largely hypothesis-generating.

8.3. *Artocarpus integer*

The dermatological evidence base for *A. integer* is currently less developed but nevertheless noteworthy. Phytochemical analyses have identified flavonoids, triterpenoids, xanthenes, flavanones, benzopyrans, phenolic compounds, and prenylated metabolites distributed across roots, heartwood, and fruit peel extracts [56,122–124].

Of particular interest are several compounds displaying potent tyrosinase inhibitory activity. Flavone 12 and arylbenzofuran 19 exhibited IC₅₀ values of 1.7 µM and 1.2 µM, respectively, indicating strong activity against a key enzymatic target involved in melanogenesis [124]. Such findings support future exploration of *A. integer* as a source of depigmenting agents for cosmetic and dermatological applications.

Additional evidence demonstrates antioxidant activity for heartwood-derived compounds, including artocarpanone, cudraflavone C, artocarpin, tephrosin, and nor-artocarpetin [56]. Root extracts also exhibit antimicrobial activity against skin-associated microorganisms, including *Staphylococcus aureus*, *S. epidermidis*, *Cutibacterium acnes*, and *Trichophyton mentagrophytes*, with minimum inhibitory concentrations reported as low as 2 µg/mL for selected compounds [57]. These findings suggest potential relevance to acne management and superficial skin infections.

Nevertheless, most evidence for *A. integer* remains restricted to phytochemical characterization and biochemical assays. Direct evaluation in validated dermatological models is largely lacking, and therefore translational conclusions should remain cautious until additional experimental and clinical data become available.

Taken together, species of the genus *Artocarpus* constitute one of the strongest dermatological clusters identified among the edible plants occurring in Cabo Verde. *Artocarpus altilis* currently possesses the most advanced evidence base, supported by mechanistic studies demonstrating wound-healing, photoprotective, anti-inflammatory, and barrier-protective activities. In contrast, *A. heterophyllus* and *A. integer* provide compelling phytochemical and mechanistic evidence but remain underrepresented in disease-specific dermatological models. Future research should focus on extract standardization, topical bioavailability, dermal safety assessment, and well-designed clinical studies to translate the substantial promise of prenylated *Artocarpus* metabolites into evidence-based dermatological and cosmeceutical applications.

Despite extensive evidence supporting anti-inflammatory, depigmenting, and wound-healing properties of *Artocarpus*-derived compounds, most findings originate from preclinical studies and require confirmation in human trials.

9. Dermatological Potential of *Ficus* Species and *Morus nigra*: Wound Repair, Inflammation Control, and Skin-Aging Modulation

The Moraceae family contributes a diverse group of edible species with emerging dermatological relevance, particularly within the genera *Ficus* and *Morus*. Although the available evidence is heterogeneous and varies considerably among species, several members of this group exhibit biological activities directly relevant to skin health, including wound healing, inflammation control, antimicrobial activity, antioxidant protection, and modulation of melanogenesis. Collectively, these properties position Moraceae species as promising sources of bioactive compounds for dermatological and cosmeceutical development [59,60,76,124–144].

9.1. *Ficus carica*

Among the evaluated Moraceae taxa, *Ficus carica* L. (common fig) possesses the strongest dermatological evidence base. The species contains a broad spectrum of phytochemicals, including flavonoids, phenolic acids, tannins, coumarins, quinones, terpe-

noids, anthocyanins, and prenylated isoflavones distributed across leaves, fruits, bark, and latex [31,32,43,44,125–128]. These compounds collectively contribute to antioxidant, antimicrobial, anti-inflammatory, and regenerative activities that are highly relevant to skin health.

Particularly noteworthy is a study demonstrating that a 5% cream prepared from fig leaves significantly accelerated wound healing in rats. Histological evaluation revealed enhanced collagen deposition, angiogenesis, and re-epithelialization, while molecular analyses demonstrated reductions in the pro-inflammatory cytokines IL-1 β , IL-6, and TNF- α [76]. The combination of histopathological and molecular endpoints makes this one of the most comprehensive wound-healing studies identified in the present review.

Additional investigations have documented potent antioxidant activity attributable to the high phenolic and flavonoid content of fig leaves and fruits [47,125,129]. Prenylated isoflavones isolated from fruits exhibit anti-inflammatory activity, whereas extracts derived from leaves and latex demonstrate antimicrobial effects against bacteria, fungi, and yeasts [44–46,130]. Together, these findings support the potential application of *F. carica* in wound care, inflammatory dermatoses, and microbiome-oriented skincare formulations.

Importantly, however, translational development of topical fig preparations requires careful consideration of safety. Unlike many other species reviewed herein, *F. carica* possesses a well-documented phototoxicity risk associated with the furanocoumarins psoralen and bergapten present in leaf and latex tissues [31,44,127,128]. Exposure to fig sap followed by ultraviolet radiation may induce phytophotodermatitis, and *F. carica* is listed in the U.S. Food and Drug Administration database of poisonous plants for this reason. Notably, these compounds are concentrated in leaves and latex rather than fruits. Consequently, future dermatological development should include mandatory phototoxicity testing and careful phytochemical standardization to distinguish potentially beneficial extracts from those presenting unacceptable safety risks.

9.2. *Ficus sur*

Compared with *F. carica*, dermatological evidence for *Ficus sur* remains largely indirect but mechanistically intriguing. Phytochemical analyses have identified more than one hundred compounds, including phenolics, flavonoids, α -amyrin acetate, β -amyrin acetate, lupeol, quercetin, stigmasterol, and related secondary metabolites [58,134]. Extracts display substantial antioxidant activity together with inhibitory effects against tyrosinase, one of the principal enzymatic targets involved in melanogenesis [58].

From a dermatological perspective, the simultaneous presence of antioxidant and tyrosinase-inhibitory activities is particularly noteworthy because both mechanisms are relevant to photoaging and pigmentation disorders. Furthermore, anti-inflammatory and immunomodulatory activities have been reported in studies evaluating multi-herbal formulations containing *F. sur* [135]. Nevertheless, direct evidence from dermatological models remains absent, and therefore current applications should be regarded as hypothesis-generating rather than evidence-based.

9.3. *Ficus sycomorus*

Ficus sycomorus exhibits a rich phytochemical composition comprising tannins, flavonoids, saponins, alkaloids, terpenoids, phenolic acids, anthocyanins, chalcones, coumarins, and cardiac glycosides [135–137]. Several studies have demonstrated antioxidant and antimicrobial activities associated with these constituents [137,138].

Of particular relevance to dermatology is the in vivo anti-inflammatory activity reported in carrageenan-induced edema models. Phytochemical characterization identified ferulic acid, catechin, chlorogenic acid, and related phenolic compounds as likely con-

tributors to the observed effects [59]. Although this evidence does not originate from skin-specific models, it supports the possibility that *F. sycomorus* may serve as a source of inflammation-modulating compounds applicable to cutaneous disorders. However, further validation in keratinocyte, fibroblast, wound-healing, or inflammatory skin models is required before definitive dermatological conclusions can be drawn.

9.4. *Ficus thonningii*

Among the lesser-studied species, *Ficus thonningii* displays particularly interesting evidence in the context of infected wounds. The species contains alkaloids, flavonoids, terpenoids, tannins, phenolic compounds, glycosides, and other secondary metabolites associated with antimicrobial and anti-inflammatory effects [139,140].

The most relevant dermatological study evaluated topical ointments prepared from ethyl acetate leaf extracts in experimentally infected wounds. Formulations containing 5% and 7.5% extract demonstrated antimicrobial activity against wound-associated pathogens and improved wound-healing outcomes in vivo, with the higher concentration producing the most pronounced effects [60]. These findings distinguish *F. thonningii* from many other medicinal plants by providing evidence in a clinically relevant infected-wound setting rather than solely in standard wound-healing models.

Additional studies have documented antioxidant, anti-inflammatory, analgesic, and antimicrobial activities [128,140]. Toxicological evaluations suggest a favorable safety profile at low doses, although dedicated dermal safety studies remain unavailable [140].

Although several *Ficus* species have demonstrated promising dermatological activities in vitro and in vivo, the current evidence base remains largely preclinical and insufficient for definitive clinical recommendations.

9.5. *Morus nigra*

Morus nigra L. (black mulberry) represents a complementary dermatological resource within the Moraceae family. Unlike the *Ficus* species discussed above, which are primarily associated with wound healing and inflammation control, *M. nigra* appears particularly promising in the context of skin aging and pigmentation disorders.

The species is rich in phenolic acids, flavonoids, anthocyanins, stilbenes, benzofurans, and related polyphenolic compounds distributed across fruits, leaves, roots, and stems [61]. Among these metabolites, oxyresveratrol and mulberroside A are of particular interest because they exhibit potent tyrosinase-inhibitory activity, directly targeting melanogenesis pathways involved in hyperpigmentation disorders [142].

In addition to depigmenting potential, *M. nigra* extracts demonstrate strong antioxidant activity through reduction in oxidative stress and lipid peroxidation [145]. Anthocyanins, rutin, quercetin, chlorogenic acid, and related compounds contribute to these effects and may provide protection against oxidative mechanisms implicated in photoaging [61,141]. Antimicrobial activities have also been reported against bacterial and fungal strains, further broadening the potential dermatological utility of the species [145,146].

Although direct dermatological studies remain relatively limited, recent reports have linked *M. nigra* extracts to wound-healing and anti-aging formulations [124]. Combined with the strong mechanistic evidence supporting antioxidant and tyrosinase-inhibitory activities, these findings position *M. nigra* as a promising candidate for future cosmeceutical applications targeting both skin aging and pigmentation disorders.

The available evidence supporting dermatological applications of *Morus nigra* is encouraging but remains primarily experimental, highlighting the need for additional translational and clinical research.

Taken together, species of the genera *Ficus* and *Morus* contribute complementary dermatological activities within the Moraceae family. *Ficus carica* and *Ficus thonningii* currently provide the strongest evidence for wound healing and inflammation control, whereas *Ficus sur* and *Ficus sycomorus* remain primarily supported by mechanistic and phytochemical data. In contrast, *Morus nigra* emerges as a particularly attractive source of anti-aging and depigmenting compounds, owing to its abundance of antioxidant polyphenols and tyrosinase inhibitors. Future research should focus on extract standardization, dermal safety assessment, phototoxicity evaluation where appropriate, and clinical validation of the promising preclinical findings reported to date.

For the species reviewed in this section, dermatological conclusions should therefore be regarded as provisional and preclinical rather than clinically established.

10. Dermatological Potential of *Passiflora* Species: From Photoprotection and Skin Aging to Translational Cosmeceutical Applications

Among the edible plant species documented in the useful flora of Cabo Verde, members of the genus *Passiflora* stand out because they provide one of the strongest bridges between phytochemical characterization, formulation development, and preliminary clinical evaluation. In particular, *Passiflora edulis* (passion fruit) has emerged as one of the most clinically relevant species identified in this review, supported by evidence spanning wound-healing models, photoprotective formulations, skin-aging interventions, and human tolerability studies. In contrast, *Passiflora quadrangularis* remains less extensively investigated in dermatological contexts but offers a promising phytochemical foundation for future skin-oriented applications [77–80,147].

10.1. *Passiflora edulis*

Passiflora edulis contains a diverse array of bioactive compounds distributed across leaves, fruits, seeds, peel, and pulp. Major phytochemical groups include flavonoids, phenolic acids, carotenoids, triterpenoids, pectin, stilbenes, and seed-oil constituents such as linoleic acid and β -sitosterol [148–153]. Representative compounds include vitexin, isoorientin, luteolin derivatives, caffeic acid, *p*-coumaric acid, trans-piceatannol, and cassigarol E, many of which possess antioxidant and anti-inflammatory properties relevant to skin health [148–152].

The strongest dermatological evidence for *P. edulis* concerns photoprotection and skin-aging prevention. Seed extracts incorporated into sunscreen formulations significantly enhanced sun protection factor (SPF) values and improved UVA-protection metrics at concentrations of 0.1–0.3%, while human patch-testing demonstrated an absence of clinically relevant irritation for the selected formulation [78]. These findings indicate that passion fruit-derived ingredients may serve as natural photoprotective adjuvants capable of improving sunscreen performance while simultaneously providing antioxidant protection against ultraviolet-induced oxidative stress.

Further translational support is provided by a non-randomized clinical study evaluating a 3% cream containing *P. edulis* seed extract. Following eight weeks of treatment, participants exhibited significant improvements in dermoscopic indicators of photoaging, accompanied by high user satisfaction and minimal adverse effects. Only one participant reported mild transient skin dryness, suggesting a favorable tolerability profile [79]. Although the study design limits definitive efficacy conclusions, the presence of human data distinguishes *P. edulis* from most other species reviewed herein and substantially strengthens its translational relevance.

Evidence for wound healing is also available. In an experimental open-wound model, topical application of *P. edulis* extracts increased fibroblast proliferation and col-

lagen deposition within healing tissues [77]. Importantly, however, enhanced histological repair did not translate into significantly faster wound closure. This distinction is noteworthy because it illustrates the importance of avoiding overinterpretation of surrogate endpoints and highlights the need for future studies incorporating clinically meaningful wound-healing outcomes [77].

The phytochemical composition of *P. edulis* provides plausible mechanistic explanations for these observations. Flavonoids, phenolic acids, carotenoids, and pectin contribute to antioxidant and anti-inflammatory activities, whereas linoleic acid and β -sitosterol exhibit tyrosinase-inhibitory effects potentially relevant to pigmentation disorders and photoaging [149–153]. The combined action of these compounds may contribute to protection against oxidative stress, extracellular matrix degradation, and ultraviolet-induced skin damage.

Additional studies have explored passion fruit peel extracts as natural UV-filter and antioxidant ingredients in topical formulations [80]. These investigations demonstrated measurable SPF-enhancing effects and favorable antioxidant activity, supporting the concept of utilizing fruit-processing by-products as sustainable cosmeceutical ingredients. However, the authors emphasized the necessity of further toxicological assessment, photostability testing, and long-term safety evaluation before commercial implementation [80]. This translational gap remains one of the principal challenges for future development of *P. edulis*-derived dermatological products.

10.2. *Passiflora quadrangularis*

Compared with *P. edulis*, dermatological evidence for *Passiflora quadrangularis* (giant granadilla) remains considerably more limited. Nevertheless, the species exhibits a rich phytochemical composition comprising phenolics, flavonoids, terpenoids, cyanogenic glycosides, and several compounds associated with antioxidant and anti-inflammatory activity [154–156]. Identified constituents include myricetin derivatives, malvidin glycosides, orientin, isoorientin, vitexin, isovitexin, genistein, kaempferol, and quercetin [154–156].

Several studies have demonstrated strong antioxidant potential associated with phenolic- and flavonoid-rich extracts obtained from pulp, mesocarp, and leaves [154,156]. Organic cultivation practices and UV-B elicitation further enhance flavonoid accumulation and antioxidant activity, suggesting opportunities for optimizing phytochemical production through agronomic and biotechnological approaches [154,156].

The species has also demonstrated antihypertensive, vasoprotective, and anticancer activities through mechanisms involving nitric oxide signaling, potassium-channel activation, endothelial protection, and apoptosis induction [147,157]. While these findings are not directly dermatological, they reflect a biologically active phytochemical profile that may prove relevant to future skin-focused investigations.

At present, however, dermatology-specific outcome studies for *P. quadrangularis* remain scarce. Although its phytochemical composition strongly suggests antioxidant and anti-inflammatory potential, direct evidence from wound-healing models, inflammatory skin disease models, photoprotection studies, or clinical dermatological investigations is currently insufficient [147]. Consequently, the dermatological relevance of *P. quadrangularis* should presently be regarded as plausible but largely hypothesis-generating.

Taken together, species of the genus *Passiflora* represent some of the most translationally advanced plant resources identified in this review. *Passiflora edulis* is distinguished by a rare combination of mechanistic studies, formulation development, human tolerability testing, and preliminary clinical evidence supporting applications in photoprotection, skin aging, and wound repair. In contrast, *P. quadrangularis* remains primarily

supported by phytochemical and pharmacological evidence, highlighting an important opportunity for future dermatological research. Continued progress will depend on extract standardization, photostability evaluation, dermal safety assessment, and well-designed randomized clinical trials capable of validating the promising early findings observed for *Passiflora*-derived ingredients.

Among the species reviewed, *Passiflora* spp. appear to possess one of the more advanced evidence bases. Nevertheless, most available studies remain preclinical, and additional randomized controlled trials are required to establish clinical efficacy in dermatological applications.

11. Development Prioritization and Regulatory Roadmap

A recurring limitation across the available literature is the heterogeneity of study designs, phytochemical characterization, and translational readiness. Consequently, prioritization of future development should not rely solely on reported biological activity but should integrate three complementary criteria: (i) strength of evidence, (ii) feasibility of safety assessment and topical use, and (iii) plausibility of the regulatory pathway.

The prioritization proposed below should be interpreted as a translational roadmap rather than as a ranking of proven dermatological efficacy. For most of the reviewed species, the available evidence remains predominantly preclinical. Therefore, priority status reflects research maturity, feasibility of phytochemical standardization, formulation potential, and the availability of preliminary safety or human data, rather than confirmed clinical benefit.

Based on these considerations, *Passiflora edulis*, artocarpin-rich *Artocarpus* preparations, and *Psidium guajava* emerge as the most advanced candidates for dermatological translation. Among these, *Passiflora edulis* currently occupies the most favorable position because it combines phytochemical characterization, formulation studies, human tolerability data, and preliminary clinical evidence supporting photoprotection and anti-photoaging applications. Such a profile aligns well with a cosmetic or cosmeceutical development pathway, where demonstration of safety, formulation stability, and claim substantiation may be more readily achievable than medicinal registration.

Artocarpin and related prenylated flavonoids from *Artocarpus* species represent the strongest mechanistically supported therapeutic candidates identified in this review. Their demonstrated effects on wound healing, angiogenesis, collagen deposition, inflammatory signaling, and UV-induced skin damage provide a coherent biological rationale for further development. However, progression toward clinical use will require standardized production, topical pharmacokinetic assessment, and formal toxicological evaluation. Depending on the intended indication, these compounds may follow either a medicinal-product pathway (wound healing and inflammatory indications) or a cosmetic pathway (photoprotection and anti-aging applications).

Psidium guajava occupies an intermediate position between therapeutic and cosmeceutical development. The availability of in vivo evidence in atopic dermatitis-like models and mechanistic validation in keratinocytes provides stronger disease-oriented support than is available for many other species reviewed herein. Nevertheless, clinical confirmation and comprehensive dermal safety studies remain necessary before translational advancement.

A second development tier includes *Syzygium jambos*, *Ficus carica*, and *Eugenia uniflora*. These species possess convincing preclinical evidence but remain limited by the absence of robust clinical validation. In particular, *Syzygium jambos* appears highly promising as a source of anti-acne agents, owing to its activity against *Cutibacterium acnes* and its multitarget anti-aging properties. *Ficus carica* demonstrates substantial wound-healing and anti-inflammatory potential; however, the documented presence of

phototoxic furanocoumarins necessitates careful safety evaluation before further development. *Eugenia uniflora* is supported by strong antioxidant and anti-inflammatory evidence and may be particularly attractive for future cosmeceutical applications.

The remaining taxa, including *Artocarpus integer*, *A. heterophyllus*, *Ficus sur*, *F. sycamorus*, *F. thonningii*, *Morus nigra*, and *Passiflora quadrangularis*, should currently be regarded as exploratory candidates. Although several possess compelling phytochemical profiles and mechanistic signals, the available evidence remains largely restricted to biochemical, microbiological, or early preclinical studies.

From a translational perspective, the highest-priority research objective is not the identification of additional bioactivities but the generation of development-enabling data. Future studies should therefore focus on standardized extract characterization using marker-based LC–MS or HPLC approaches, stability assessment, dermal irritation and sensitization testing, phototoxicity evaluation where relevant, and mechanistically anchored skin models. Subsequently, randomized controlled pilot studies should be undertaken for the most mature candidates, particularly *Passiflora edulis*, artocarpin-rich *Artocarpus* preparations, and *Psidium guajava*. Such an evidence-driven strategy would provide a realistic pathway from ethnobotanical and phytochemical observations toward clinically and regulatory relevant dermatological products.

12. Conclusions and Future Directions

The edible plant species occurring in and utilized throughout Cabo Verde represent a diverse and scientifically credible source of dermatologically relevant bioactive compounds. Collectively, the evidence reviewed in this study demonstrates that members of the Myrtaceae, Moraceae, and Passifloraceae families contain phytochemicals capable of modulating key biological processes involved in skin health, including oxidative stress, inflammation, microbial colonization, extracellular matrix remodeling, wound repair, pigmentation, and UV-induced damage.

Among the evaluated taxa, *Passiflora edulis*, *Psidium guajava*, *Ficus carica*, and *Artocarpus* species are currently supported by the most mature evidence base, encompassing combinations of phytochemical characterization, mechanistic investigations, in vivo efficacy studies, formulation development, and, in some cases, preliminary human data. Particularly noteworthy are the wound-healing and photoprotective properties of artocarpin-rich *Artocarpus* preparations, the anti-inflammatory effects of *Psidium guajava* in atopic dermatitis-like models, the regenerative activity of *Ficus carica* topical formulations, and the emerging clinical evidence supporting photoprotective and anti-photoaging applications of *Passiflora edulis*. In parallel, *Syzygium jambos* provides one of the strongest anti-acne signals identified within the reviewed plant set, while *Eugenia uniflora* and *Morus nigra* offer promising opportunities for future anti-aging and pigmentation-oriented applications.

Despite these encouraging findings, the available evidence remains heterogeneous and is frequently limited by insufficient extract standardization, incomplete phytochemical characterization, inadequate reporting of topical safety, and the scarcity of well-designed clinical studies. Many investigations rely on antioxidant assays or isolated mechanistic endpoints that, although biologically informative, provide limited predictive value for clinical efficacy. Consequently, the current body of evidence should be interpreted primarily as an assessment of translational potential rather than definitive proof of therapeutic effectiveness.

Future progress will depend on the generation of development-enabling evidence rather than the continued accumulation of exploratory bioactivity studies. Priority should be given to the establishment of standardized botanical materials and marker-based phytochemical specifications, supported by reproducible analytical methods

and stability assessments. Equally important are comprehensive dermal safety programs, including irritation, sensitization, and phototoxicity testing, particularly for species known to contain potentially photoreactive constituents. Mechanistically anchored experimental models employing keratinocytes, fibroblasts, reconstructed skin systems, and disease-relevant in vivo models should replace reliance on generic antioxidant screening whenever possible.

From a translational perspective, a tiered development strategy appears justified. *Passiflora edulis* currently represents the most advanced candidate for cosmetic and cosmeceutical development, owing to its combination of formulation feasibility, tolerability data, and preliminary clinical evidence. Artocarpin-rich *Artocarpus* preparations and *Psidium guajava* extracts emerge as the most promising candidates for therapeutic-oriented dermatological applications, whereas *Syzygium jambos* may provide a valuable platform for future anti-acne product development. The remaining species reviewed herein should be regarded as important discovery-stage resources that warrant further mechanistic and translational investigation.

Overall, the edible flora of Cabo Verde constitutes a valuable and underexplored reservoir of dermatological compounds with potential applications spanning wound management, inflammation control, antimicrobial therapy, photoprotection, skin aging, and pigmentation disorders. By integrating ethnobotanical knowledge with modern phytochemistry, formulation science, toxicology, and clinical research, these plant resources may contribute to the development of evidence-based dermatological and cosmeceutical products while simultaneously highlighting the scientific and biocultural value of Cabo Verde plant biodiversity.

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