

Medicinal Plants and their Constituents in the Treatment of *Acne vulgaris*

Dina Abozeid¹ , Ghada Fawzy^{2,*} , Marwa Issa² , Nourtan Abdeltawab³ , Fathy Soliman²

¹ Egyptian drug authority, Cairo 11562, Egypt

² Department of Pharmacognosy, Faculty of Pharmacy, Cairo University, Cairo 11562, Egypt

³ Department of Microbiology and Immunology, Faculty of Pharmacy, Cairo University, Cairo, 11562, Egypt

* Correspondence: ghada.ah.fawzy@pharma.cu.edu.eg (G.F.);

Scopus Author ID 21734114400

Received: 30.12.2021; Accepted: 24.01.2022; Published: 3.04.2022

Abstract: Acne is a chronic inflammatory skin disorder that involves the pilosebaceous unit. It is a common universal disease affecting about 85% of teenagers. The disfiguring dermatosis of acne can destroy self-confidence, causing significant emotional distress. Topical and systemic therapies are available as a conventional acne treatment, including comedolytic agents, antibiotics, and various anti-inflammatory drugs. Interest in medicinal herbs has been progressively increasing due to antibiotic resistance in acne-causing bacteria, side effects, and sometimes high cost of conventional treatment. This review provides up-to-date evidence on medicinal plants and the phytoconstituents used in acne treatment. The data presented in this review were gathered from several databases, including Pubmed, Wiley Online Library, Elsevier, and Web of Science, using keywords such as; *Acne vulgaris*, *Cutibacterium acnes* (formerly *Propionibacterium acnes*), skin diseases, medicinal plants, active constituents, complementary and alternative medicines. The present manuscript provides an updated review of the most reported active constituents with anti-acne properties. Among these classes were the phenolic compounds, exemplified by anthraquinones, flavonoids, tannins, alkaloids, certain terpenes and oxygenated terpenes present in the essential oils of many medicinal plants.

Keywords: *Acne vulgaris*; *Cutibacterium acnes*; *Propionibacterium acnes*; *Staphylococcus epidermidis*; skin diseases; medicinal plants; essential oils; antimicrobial activity; antibiotic resistance.

© 2022 by the authors. This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Acne vulgaris is a disfiguring prolonged inflammatory disorder of the pilosebaceous units. The psychological impacts of acne include loss of self-confidence, depression, anxiety, and interpersonal and work-related difficulties. The clinical presentation of acne comprises black and whiteheads (comedones), pinheads (papules), pustules, nodules, and pitted or hypertrophic scars [1]. The face, shoulders, upper chest, and back may be affected [2].

Acne vulgaris is mainly attributed to the increased production of androgens present in males and females during puberty. Accordingly, the pilosebaceous units produce more sebum, followed by follicular hyperkeratinization and plugging of the hair follicles. Thus, sebum cannot reach the skin surface, which encourages anaerobic bacteria, including *Cutibacterium acnes* (formerly *Propionibacterium acnes*), to grow in the plugged follicle. These bacteria trigger an inflammatory response in the skin, manifested as heat, swelling, redness, and pus [3].

The Global Burden of Disease (GBD) reported in 2010 that *Acne vulgaris* was the eighth most common skin disease, with an estimated global prevalence (for all ages) of 9.38% [4]. It affects more than 85% of teenagers, and boys most frequently have severe forms of the disease [5]. More than 100 million US dollars are spent on over-the-counter acne products [6]. Acne is a multifactorial disease affected by interacting factors, and the main risk factors are summarized in figure 1 [7].

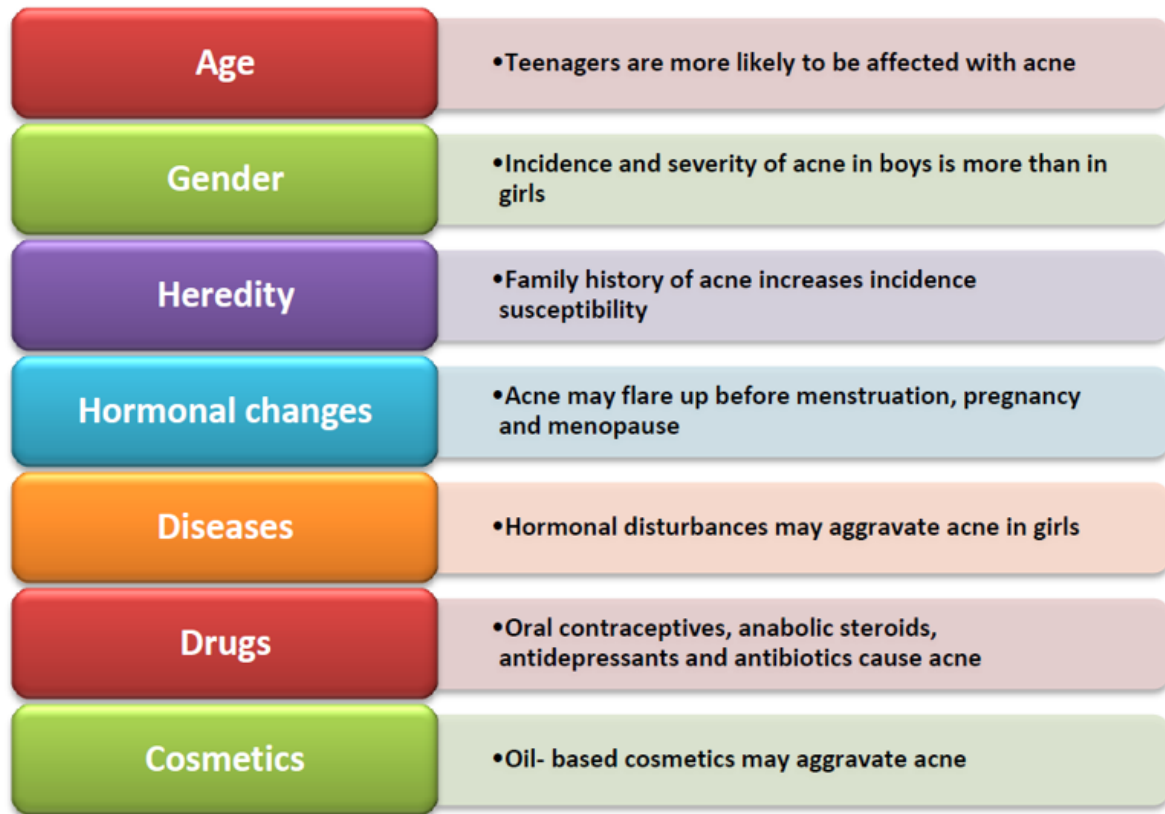


Figure 1. Predisposing factors of *Acne vulgaris*.

Acne treatment aims to control existing lesions, prevent permanent scarring as far as possible, limit the duration of the disorder, minimize morbidity and guard against the formation of new acne lesions. Anti-acne drugs may act by normalization of follicular keratinization, thus suppressing sebum production. Others exert antibacterial action against *Cutibacterium acnes*, alleviating inflammation and, through the antioxidant effect, reducing oxidation of sebum, which favors the growth of *C. acnes*. Conventional acne treatment involves topical alone or in combination with systemic therapies in severe cases. Topically used agents include comedolytic agents, antibiotics, and various anti-inflammatory drugs. Systemically used agents include retinoids, antibiotics, zinc, and hormones [8]. Topical treatment is the standard for most patients with comedo-papular acne; however, local and systemic treatments are needed for pustulocystic scarring acne [9]. Drawbacks of conventional therapy include increased antibiotic resistance in acne-causing bacteria (*C. acnes* and *S. epidermidis*) [9]. Moreover, the increased incidence of pregnant women exposed to oral tretinoin, a known teratogen [10], and the poor safety profile of systemic retinoid therapy [9,11].

Herbal therapy of acne has been encouraged due to the advantages of better patient tolerance, long history of use, fewer side effects, and being relatively more cost-effective. Many herbs with a history of use in traditional cultures have entered the growing ‘cosmeceuticals’ market. The efficacy of herbs used in acne treatment is due to their

antibacterial activity and their influence on sebum activity, inflammation, and hyperkeratinization associated with acne. This review aspires to provide up-to-date evidence on medicinal plants and the phytoconstituents used in acne treatment.

2. Materials and Methods

The data presented in this review were assembled from several databases, including PubMed, Wiley Online Library, Elsevier and Web of Science Core Collection, and digital search platforms. The search terms were *Acne vulgaris*, acne, anti-acne, *C. acnes*, skin diseases, medicinal plants, herbal medicines, phytotherapy, Ayurveda, Unani, and Chinese traditional medicine. Additionally, the reference lists of articles were reviewed for additional relevant studies.

3. Results and Discussion

Many efforts have been made to study medicinal herbs' anti-acne activity and investigate the phytoconstituents responsible for that activity. The following part compiles the medicinal plants used in acne treatment, classified according to the class of their active constituents.

3.1. Phenolic compounds.

Phenolic and polyphenolic constituents contribute to vital processes of plant physiology. Phenolic compounds demonstrate activity against *C. acnes* via their antimicrobial, antioxidant, and anti-inflammatory properties, thus exhibiting an anti-acne effect. Table 1 summarizes studies on herbs containing anti-acne phenolic compounds and their mode of anti-acne action.

Table 1. Herbs containing anti-acne phenolic constituents.

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
<i>Aloe barbadensis</i> Miller	Aloe vera	Leaf gel	Applied topically to treat skin ailments, seborrhic dermatitis, psoriasis Vulgaris, genital herpes, skin burns, and <i>Acne vulgaris</i>	Antioxidant, Anti-inflammatory, Antimicrobial, Anti-acne effect in vivo	Aloin and emodin	[12-17]
<i>Aloe ferox</i> Mill.	Bitter aloe Cape aloe	Leaves and roots	Applied topically or ingested to treat eczema, dermatitis, and acne	Antioxidant, Anti-inflammatory, Antimicrobial	Aloe-emodin, aloin A, Aloesin	[18-20]
<i>Arctium lappa</i> L.	Edible burdock	Root, seed	Topical remedy for skin problems such as eczema, acne, and psoriasis	Antioxidant, Anti-inflammatory, Antimicrobial	Lappaol F, and diartigenin	[21-23]
<i>Artocarpus hirsutus</i> Lam.	Wild jack	Stem bark	Skin diseases including hydrocele, pimple, heal sores, cracks in the skin	Antimicrobial	Pyranocycloartobiloxa-nthone A, and artonine E	[24]
<i>Artocarpus integer</i> (Thunb.) Merr.	Cempedak	Root	Skin diseases as antimicrobial	Antimicrobial	Artocarpin ,cudraflavone C and artocarpanone	[25]
<i>Berberis vulgaris</i> L.	Barberry	Root, fruit	Eliminate inflammation orally and topically. It's used to treat skin diseases	Anti-inflammatory, Anti-acne (in vivo)	Anthocyanins,Flavonoid	[26-30]
<i>Caesalpinia sappan</i> L.	Brazil or sappan wood	Heartwood	Skin diseases Anti-acne	Antioxidant, Antimicrobial, Anti-inflammatory	Brazilin, sappanchalcone, protosappanin a, protosappanin c, protosappanin d, protosappanin e, sappanone b	[31,32]
<i>Camellia sinensis</i> L.	Green Tea	Leaves	Protection and moisturization of the skin and hair	Antimicrobial, Anti-inflammatory, Anti-acne in vivo, Antioxidant, 5 α -reductase inhibitory	Epigallocatechin-3-gallate EGCG, EC, GCG, ECG, EGC, and GA,	[33-39]

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
<i>Carthamus tinctorius</i> L.	Safflower	Flower	Used to heal old wounds. Moisturer in skin crèmes and lotions	Anti-acne in vivo, Antioxidant	Flavonoids	[40-42]
<i>Casuarina equisetifolia</i> L.	Ironwood	Bark	Astringent, lotion for swelling	Anti-acne In vivo, Antioxidant activity	Catechin, ellagic acid, gallic acid, quercetin and lupeol, coumaroyl triterpenes, d-galocatechin and tannins	[43-45]
<i>Curcuma longa</i> L.	Turmeric	Rhizome	Alleviating skin inflammation, used as a paste for skin eruptions and infections	Anti-acne In vivo, Anti-inflammatory, Antimicrobial, Antioxidant	Curcumin, demethoxycurcumin, bisdemethoxycurcumin	[14,31,46-48]
<i>Eisenia bicyclis</i> (Kjellman) Setchell	Sea oak	-	-	Anti-inflammatory, Antimicrobial	Phlorotannin: fucofuroeckol-A	[49,50]
<i>Embelia ribes</i> Burm F.	Vidanga	Fruit	Dyeing hairs, good pimple remover, treating Acne, treating carbuncle infections, treating vitiligo and leucoderma	Antimicrobial, Anti-inflammatory, Antioxidant, Anti-lipase	Tanninspara-benzoquinone: embelin	[51-54]
<i>Emblica officinalis</i> L.	Amla or indian gooseberry	Fruit	Acne and other skin disorders	Anti-acne In vivo, Anti-inflammatory, Antioxidant	Gallic acid, methylgallate, corilagin, furosin, and geraniin	[55-59]
<i>Epimedium brevicornum</i> Maxim	Horny goat weed	Herb		Antimicrobial	Icariin (flavonol)	[60]
<i>Eucalyptus maculata</i> Hook.	Eucalyptus	Leaf	Wounds, ulcers of the skin	Antimicrobial, Antioxidant	2', 6'-dihydroxy-3'-methyl-4'-methoxy-dihydrochalcone, eucalyptin and 8-desmethyl-eucalyptin,	[61,62]
<i>Excoecaria cochinchinensis</i> Lour.	Chinese Croton, jungle fire	Leaf	-	Antimicrobial	Phenolic compounds, gallic acid	[63]
<i>Greyia flanaganii</i> H. Bolus	Kei bottlebrush	Leaf	-	Antimicrobial, Antioxidant	(3S)-4-hydroxyphenethyl 3-hydroxy-5-phenylpentanoate, 2',4',6'-trihydroxydihydrochalcone, 2',6',4-trihydroxy-4'-methoxydihydrochalcone, 2',6'-dihydroxy-4'-methoxydihydrochalcone, 5,7-dihydroxyflavanone [(2S)-pinoce mbrin], 2',6'-dihydroxy-4',4'-dimethoxydihydrochalcone, (2R,3 R)-3,.5,7-trihydroxy-3-O-acetylflavanone	[64]
<i>Garcinia mangostana</i> L.	Mangosteen	Fruit rind	Eczema, hyperkeratosis, and other skin disorders such as psoriasis and wounds	Antimicrobial, Anti-acne In vivo	Alpha-mangostin	[65,66]
<i>Intsia palembanica</i> Miq.	Merbau	Wood	Skin whitening activity	Anti-lipase	Fustin, ampelopsin & 4'-dehydroxyrobidanol	[67]
<i>Iris ensata</i> Thunb.	Irsa Irsa	Root	Cosmetic preparations for skin roughness and aging	Anti-acne effect In vivo, Antioxidant	Flavonoids and phenolics	[15,68-70]
<i>Kaempferia pandurata</i> (Roxb.)	Fingerroot Chinese ginger	Rhizome	-	Antimicrobial	Panduratin A and isopanduratin A	[71]
<i>Lavendula stoechas</i> L.	French lavender	Flower	Various inflammatory diseases	Antimicrobial, Anti-inflammatory, Antioxidant	Caffeic acid, quercetin, lutelin, rosmarinic acid	[72-76]
<i>Lens culinaris</i> Medik.	Lentil	Seed	Topically applied for the treatment of skin infections and burns as traditional medicine	Anti-acne In vivo, Anti-inflammatory Antioxidant	Flavonoids and condensed tannins	[77-79]
<i>Magnolia sp.</i>		Stem bark	-	Antimicrobial, Anti-inflammatory	Honokiol and magnolol,	[80]
<i>Mangifera indica</i> L.	Mango	Seed Kernel	Decoction of the kernel has been used to treat infectious wounds, ulcers	Antimicrobial, Antioxidant	Gallic acid	[81]
<i>Morus alba</i> L.	white mulberry	Cortex Stem		Anti-inflammatory, Antioxidant, Antimicrobial	Polyphenols	[82-85]
<i>Morus nigra</i> L.	Black Mulberry	Fruit		Antimicrobial, Antioxidant	Tannin, flavonoids	[86]

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
<i>Myristica fragrans</i> (Houtt.)	Nutmeg	Seed	-	Antimicrobial, Anti-inflammatory	(+)- Erythro- $\Delta^{8'}$ -7S,8R-dihydroxy-3,3,5'-trimethoxy-8-O-4'-neolignan (+)-Erythro- $\Delta^{8'}$ -7-hydroxy-3,4,3',5'-tetramethoxy 8-O-4'-neolignan Erythro- $\Delta^{8'}$ -7-acetoxy-3,4,3',5'-tetramethoxy-8-O-4'-neolignan	[87]
<i>Olea europaea</i> Linn.	Common Olive	Leave	Gentle care and treatment of the skin	Anti-acne effect In vivo, Anti-inflammatory, Antioxidant, Antimicrobial	Flavonoids including luteolin and apigenin derivatives.	[15,88-90]
<i>Plumbago indica</i> L.	Scarlett Leadwort	Root	It is used for wound healing, tinea versicolor, and ringworm	Antimicrobial	Plumbagin, 3,3'-biplumbagin and elliptinone.	[91]
<i>Polygonum cuspidatum</i> Sieb. et Zucc	Japanese knotweed	Rhizome	-	Antimicrobial, Anti-acne effect In vivo	Resveratrol	[60,92]
<i>Psidium guajava</i> L.	Guava	Leaf	Oral antibacterial drugs to manage surgical, skin, and soft tissue infections	Antimicrobial, Antioxidant	Quercetin quercetin-3-O-glucopyranoside Morin	[93-95]
<i>Punica granatum</i> L.	Pomegranate	Fruit peel	Inflammation-related diseases	Anti-bacterial, Anti-lipase, Anti-inflammatory	Punicalagin, punicalin, strictinin a, granatin b	[17,96]
<i>Pulsatilla koreana</i> (Yabe ex Nakai) Nakai ex T. Mori	Korean Pasque Flower	Root	Skin-whitening effect	Antimicrobial	Pulsaquinone, hydropulsaquinone, and structurally related 1, 4-quinone derivatives	[97]
<i>Quercus acutissima</i> Carr.	Sawtooth oak	Cortex	Skin disorders	5 α -reductase inhibitor	Tetragalloyl glucose, pentagalloyl glucose, eugenin, 1-desgalloyl eugenin, casuarinin, castalagin, stenophyllanin C, (-)-epicatechin gallate, and (-)-epigallocatechin gallate	[98]
<i>Rheum ribes</i> L.	Rhubarb	Root	Strong astringent in China to treat inflammation-related	Anti-inflammatory, Antimicrobial	Rhein, emodin, chrysophanol	[99-101]
<i>Rhinacanthus nasutus</i> L.	snake jasmine	Leaf	Treatment of Tinea versicolor, ringworm, pruritic rash, abscess pain, and skin diseases	Antimicrobial	Rhinacanthins-rich extract	[102]
<i>Rubia cordifolia</i> L.	Common Madder	Root	Skin diseases associated with edema and oozing	Anti-acne In vivo antimicrobial activity	Anthraquinone	[77,103]
<i>Rosmarinus officinalis</i> L.	Rosemary	Herb	Reduce swelling and puffiness of the skin. Burns	Anti-inflammatory, Antioxidant, Antimicrobial	Rosmarinic acid	[104-106]
<i>Schisandra chinensis</i> Turkz. (Baill.)	Magnolia-Vine	Fruits	Skin diseases, such as atopic dermatitis, photo-aging, and hair loss	Anti-inflammatory, Antimicrobial	Lignans: schisandrin A, schisandrin B, and schisandrin C	[107]
<i>Scutellaria baicalensis</i> Georgi.	Asian skullcap,	Root	Skin disorders	Antioxidant, Anti-inflammatory, Anti-acne in vivo	Baicalein, oroxylin A , wogonin, 7-O-methylwogonin, skullcapflavone II, 5,7,4'-trihydroxy-8 methoxyflavone , viscidulin II, and ganhuangenin	[108-112]
<i>Terminalia chebula</i> Retz.	Chebulic myrobalan	Fruit	Skin disease, wound healer	Antimicrobial, Anti-lipase, Antioxidant, Anti-inflammatory, Anti-acne effect in vivo	Chebulagic acid	[14,53,113-115]
<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Arjun	Stem bark	Wound healing, acne	Antimicrobial, Antioxidant, Anti-inflammatory, anti-acne effect in vivo	Flavonoids	[14,116-118]
<i>Terminalia laxiflora</i> (Engl. &Diels)	Heartwood	Wood	Alleviate rheumatic pain, moisturize skin and cause general body relaxation in addition to other cosmetic and medicinal uses	Antimicrobial, Anti-lipase, Antioxidant	Ellagic acid, flavogallonic acid dilactone, terchebulin and gallic acid	[119]

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
<i>Zingiber officinale</i> Roscoe	Ginger	Rhizome	Dermatitis	Antioxidant, Anti-acne in vivo, Anti-inflammatory	Gingerols and shogaols	[48,56,120-124]

3.2. Terpenoids and steroids

Terpenoids represent the largest and most diverse group of naturally occurring plant secondary metabolites. The role of terpenoids in acne may be due to their antibacterial activity against *Cutibacterium acnes*, anti-oxidant or anti-inflammatory activity. Table 2 summarizes herbs containing anti-acne terpenoids, steroids, and their reported mode of action.

Table 2. Herbs containing anti-acne terpenoid constituents.

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
<i>Boswellia serrata</i> Roxb.	Indian olibanum tree	Kundur Oleo-Gum-Resin	Skin and blood diseases	Antimicrobial, Anti-inflammatory	Beta-boswellic acid 3-acteyl-beta-boswellic acid, 11-keto-beta-boswellic acid, 3-acetyl-11-keto-beta-boswellic acid	[15,125-128]
<i>Cinnamomum zeylanicum</i> Blume	Ceylon cinnamon	Bark	Inflammatory disorders	Antimicrobial Antioxidant, Anti-inflammatory	Cinnamaldehyde and eugenol	[129-131]
<i>Citrus aurantium</i> L.	Bitter Orange	Peel		anti-inflammatory Antimicrobial	Farnesol	[132]
<i>Citrus reticulata</i> Blanco	Mandarin	Peel	Reduce cellulite, stretch marks, scars	Antimicrobial	D-Limonene	[133]
<i>Commiphora mukul</i> Hook.	Guggul	Oleo-gum resin of the stem bark	Inflammatory diseases	Anti-inflammatory, Antioxidant	Triterpenes, myrrhanol A, myrrhanone A	[134-136]
<i>Eriobotrya Japonica</i> (Thunb.) Lindl.	Loquat	Leaf	Inflammatory disorders	Antioxidant, Anti-inflammatory	Triterpenoids: ursolic acid, oleanolic acid, methyl corosolate, maslinic acid, corosolic acid, pomolic acid, tormentic acid, euscaphic acid	[105,137,138]
<i>Eucalyptus globulus</i> Labill.	Blue Eucalyptus	Leaf	Wounds, ulcers of the skin	Antimicrobial, Anti-inflammatory, Anti-lipogenic	1,8-Cineole γ-terpinene, α-pinene, p-cymene	[139-141]
<i>Glycyrrhiza glabra</i> L.	Liquorice	Rhizome	Anti-inflammatory	Antimicrobial, Antioxidant, Hormone balancing	Glycyrrhizic acid	[10,17,33,105,142-144]
<i>Hemidesmus indicus</i> R. Br.	Indian sarsaparilla	Root	Depurative and tonic that is used to treat patients with chronic skin disease	Anti-inflammatory, Antimicrobial, Antioxidant	Terpenoids	[14,46,145-148]
<i>Lavandula stoechas</i> L.	French lavender	Flower	Various inflammatory diseases.	Antimicrobial, Anti-inflammatory, Antioxidant	Camphor, fenchone	[72-76]
<i>Matricaria chamomilla</i> L.	Chamomile	Leaf, flower head	Anti-inflammatory and antiseptic	Antimicrobial, Antioxidant, Anti-androgen Anti-inflammatory	Bis-abolol oxide A , camazulene, o-cimene, α-farnesene, spathulenol	[98,149,150]
<i>Melaleuca alternifolia</i> (Maiden & Betche)	Tea tree	Leaf	Topical application to treat bruises, insect bites, and skin infections	Anti-acne in vivo, Antimicrobial, Anti-inflammatory, Antioxidant	Terpinen-4-ol, α-terpineol, α-pinene	[151-156]
<i>Momordica charantia</i> L.	Bitter melon	Fruit leaf	Applied locally in case of chronic skin diseases and to treat burns, boils, and rashes	Anti-inflammatory	Phytol and lutein from fruit B-ionone from leaves	[157,158]
<i>Nostoc commune</i> Vauch	Star jelly		-	Antimicrobial, Anti-inflammatory	Nostocionone, nostocionone derivative	[159]
<i>Ocimum basilicum</i> L.	Sweet Basil	Leaf	Wounds, acne, and vitiligo	Antimicrobial, Anti-inflammatory, Antioxidant	Neral, citral, α-humulene, β-caryophyllene, linalool, and germacrene-d	[160-163]
<i>Olea europaea</i> L.	Common Olive	Leaf	Gentle care and treatment of the skin	Anti-inflammatory Antioxidant, Antimicrobial	Iridoid monoterpenes including oleuropein, oleuroside, triterpenes; oleanolic and maslinic acid	[15,88-90]

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
<i>Origanum vulgare</i> L.	Oregano	Leaf	-	Antimicrobial, Anti-inflammatory	Thymol	[164,165]
<i>Picrorrhiza kurroa</i> Royle ex Benth	Kutki	Rhizome	<i>Acne vulgaris</i> and acne rosacea associated with acneiform postulation	Anti-inflammatory, Antioxidant	Picroside-I and picroside-II	[166-168]
<i>Pinus densiflora</i> (Sieb. Et Zucc)	Japanese red pine	Cones	Cosmetic formulation With anti-inflammatory, antioxidant, and anti-proliferative-effects on cancer cells	Antimicrobial	9 Labdane-type diterpenes	[169]
<i>Prumnopitys andina</i> Poepp. Ex Endl.	Chilean plum yew	Stem bark		Antimicrobial	Abietane diterpene, 2-acetoxyferruginol	[170]
<i>Psidium guajava</i> L.	Guava	Leaf	Oral antibacterial drugs to manage surgical, skin, and soft tissue infections	Antimicrobial, Antioxidant	α -pinene	[93,94]
<i>Psoralea corylifolia</i> L.	Buguchi	Fruit	The inflammatory diseases, mucomembranous disorders, dermatitis, and edematous conditions of the skin	Antimicrobial, Anti-inflammatory, Antioxidant	Bakuchiol, α meroterpene	[171-173]
<i>Rabdosia rosthornii</i> (Diels) Hara	Isodon	Leaves	Pyrexia, edema and abdominal distention	Antimicrobial	Ent-kaurene diterpenoids, namely, rosthornins A–D	[174]
<i>Rosa damascena</i> Mill.	Damask rose	Flower	Toner for oily skin, prone to acne	Antimicrobial, Anti-inflammatory, Antioxidant	Geraniols, β -citronellol nonadecane nerol	[72,175-177]
<i>Rosmarinus officinalis</i> L.	Rosemary	Herb	Reduce swelling and puffiness of the skin, burns	Anti-inflammatory, Antioxidant, Antimicrobial	Carnosol, carnosic acid, and rosmarinic acid	[104-106]
<i>Salvia miltiorrhizae</i> Bunge	Danshen	Root	Acne, psoriasis, eczema, and other skin conditions	Anti-inflammatory, Antioxidant, Antimicrobial 5 α reductase inhibition	Diterpene quinone (tanshinone) cryptotanshinone	[40,178-180]
<i>Sapindus mukorossi</i> Gaertn	Indian soapberry	Fruit pericarp	Whitening and freckle-removing ability when used as a face wash	Antimicrobial Lipase and tyrosinase inhibitor	Four oleanane-type triterpenoid saponin. Sapindoside A and B	[181,182]
<i>Solanum melongena</i> L.	Eggplant	Fruit		Suppressed lipogenesis, Follicular dyskeratosis normalization, Anti-inflammatory	Lupeol	[183]
<i>Sophora flavescens</i> Ait.	Shrubby sophora	Radix	Eczema, inflammatory disorders, ulcers and skin burns	Antimicrobial, 5 α reductase inhibition	Lupeol	[184,185]
<i>Syzygium aromaticum</i> L.	Clove	Flower buds	Antimicrobial	Anti-inflammatory	Eugenol eugenyl acetate, β -caryophyllene	[186]
<i>Syzygium jambos</i> L.	Rose apple	Leaf	Acne	Antimicrobial, Anti-inflammatory, Antioxidant	Anacardic acid analogue, ursolic acid	[187]
<i>Vetiveria zizanoides</i> L.	Vetiver grass	Root	Sense of heat and dermatoses	Anti-inflammatory, Antioxidant	Valerenol valeranal β -Cadinene	[188-191]
<i>Withania somnifera</i> L.	Ashwagandha	Root	Skin diseases	Antimicrobial, Anti-inflammatory, Antioxidant	Glycowithanolides identified as sitoindosides VII-X and withaferin A	[14,192-194]

3.3. Alkaloids.

Alkaloids are a major class of phytoconstituents and have been well studied for acne treatment (Table 3). Berberine has been reported to exhibit antimicrobial activity against *Cutibacterium acnes*, *Staphylococcus* spp., and decrease lipogenesis by sebaceous glands in hamsters [195].

Table 3. Herbs containing anti-acne alkaloids.

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
<i>Achillea millefolium</i> L.	Yarrow	Flowering tops	Acute eczema, burn, bruise, wounds, ulcerations, varicose ulcers, cracks, breast fissure, abscess, impetigo, tinea, leucorrhoea	Antioxidant, Anti-inflammatory, Antimicrobial	An Alkamide: N-(21-hydroxy-21-(piperidin-1-yl) hencosa-17, 19-diyl-1-yl) acetamide.	[10,196,197]
<i>Berberis vulgaris</i> L.	Barberry	Root, fruit	Topically used for skin diseases	Anti-inflammatory, Anti-acne in vivo	Berberine	[26-30]
<i>Coptis chinensis</i> HuangLian	Chinese goldthread	Root	Severe skin and inflammation-related diseases	Anti-lipogenic, Anti-inflammatory, Antimicrobial, Antioxidant	Berberine	[142,198-200]
<i>Hydrastis canadensis</i> L.	Goldenseal	Root	Wounds, and local inflammation	Anti-inflammatory, Antioxidant, Antimicrobial	Berberine	[201-203]
<i>Mahonia aquifolium</i> (Pursh) Nutt.	Oregon grape	Root	Various skin inflammatory conditions, psoriasis	Antimicrobial, Antioxidant, Anti-inflammatory	Protoberberine, berberine and jatrorrhizine	[204-206]

3.4. Fatty acids.

Sebum secretion is one of the main factors of acne pathogenesis. Quantitative and qualitative alterations have been observed in sebum from acne patients. The C16 : 0/C16 : 1 ratio in the skin surface triglycerides and wax esters is higher in acne patients. It has been suggested that the desaturation of fatty acids may play a major role in sebogenesis and acne onset. It has been reported that linoleic acid is effective in acne treatment. In a double-blind placebo-controlled randomized cross-over study, topically applied linoleic acid significantly affected the size of follicular casts and microcomedones [207,208]. Therefore, plants containing linoleic acid may be used in acne treatment. Table 4 summarizes herbs containing fatty acids and their reported mode of action.

Table 4. Herbs containing anti-acne fatty acids.

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
<i>Olea europaea</i> Linn.	Common olive	Oil	Gentle care and treatment of the skin	Anti-acne effect in vivo, Anti-inflammatory, Antioxidant, Antimicrobial	Glycerides of oleic, linoleic, palmitic, and stearic acids	[15,88-90]
<i>Papaver somniferum</i> L.	Poppy seeds	Seeds	Reduce skin inflammation scalp infections and promotes overall skin and hair health	Antimicrobial, Anti-inflammatory, Antioxidant	Triglycerides, including linoleic, oleic, and palmitic acids	[129,209,210]
<i>Prunus japonica</i> Thunb.	Japanese bush cherry	Seed		Antimicrobial	Linoleic acid	[211]

3.5. Miscellaneous constituents.

Some plants have been studied for their anti-acne activity due to their antimicrobial, anti-inflammatory, anti-androgen, and antioxidant activities. Their constituents belong to different chemical classes; these herbs are summarized in table 5; all these have anti-acne activities due to various constituents.

Table 5. Herbs containing miscellaneous anti-acne constituents.

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
<i>Achyranthes aspera</i> L.	Prickly chaff flower	Seeds	<i>Acne vulgaris</i> , eruptions of the skin, boils, scabies, and other skin diseases	Antimicrobial, Antioxidant, Anti-androgen	Oleanolic acid glycosides, Betaine, achyranthine, hentriacontane, ecdysterone, achyranthes saponins A, B, C, D	[212-215]
<i>Allium cepa</i> L.	Onion	Fruit	Topically for reducing the appearance of scars	Antimicrobial, Antioxidant	Thiosulfinates: MeS(O)S 1-propenyl (E,Z); n-PrS(O)S	[216,217]

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
					1-propenyl-(E); n-PrS(O)S 1-propenyl-(Z); trans-zwiebelane; n-PrS(O)CHEtSS-1propenyl; 1-propenylS(O)CHEtSS1-propenyl	
<i>Anemarrhena asphodeloides</i> Bunge	Jimo	Rhizome	Anti-inflammatory	5 α -reductase inhibitor, Anti-inflammatory, Antioxidant	Timosaponin BIII (TBIII) and trans-hinokiresinol (r-HL)	[218-221]
<i>Andrographis paniculata</i> (Burm.f.) Nees	Chiraita	Leaf	Skin infections	Antimicrobial, Antioxidant, Anti-inflammatory, Anti-androgen	Andrographolide (labdane diterpenoid) and echiodinin (polyphenol)	[214,222-226]
<i>Astragalus sarcocolla</i> Dymock.	Anzroot	Manna	Abscesses and curing wounds	Anti-acne effect In vivo	Flavonoids, saponins (astragalosides), polysaccharides, triterpenes, glycosides, fatty acids	[15,214,227]
<i>Azadirachta indica</i> A.Juss.	Neem	Leaf	Acne, psoriasis, eczema, ringworm, and even stubborn warts	Anti-acne In vivo, Anti-inflammatory, Antimicrobial	Azadirachtin, nimbin, nimbidin, nimbolide, and limonoids quercetin and β -sitosterol	[228-231]
<i>Calendula officinalis</i> L.	Calendula	Flower heads	Bruised or damaged skin. Also traditionally used for the care of varicose veins.	Antioxidant, Antimicrobial, Anti-fibrotic, Anti-inflammatory, Antioxidant	Triterpenoids, flavonoids, coumarins, quinones, volatile oil, carotenoids	[232-236]
<i>Cassia alata</i> L.	Candle bush	Leaf	Skin diseases like eczema, including rough skin, blisters, inflammation, itchiness, and bleeding	Antimicrobial, Antioxidant, Anti-acne in vivo	Flavones, flavonols, flavonoids glycosides, alatinon, alanonal and β -sitosterol- β -d-glucoside	[228,237-239]
<i>Codonopsis pilosula</i> (Franch.) Nannf.	Dangshen	Root	Tonic	Antioxidant, Anti-inflammatory	Polyacetylenes, phenylpropanoids, alkaloids triterpenoids	[240-242]
<i>Cyperus rotundus</i> L.	Nagarmootha	Rhizome	Dermatitis and other skin disorders.	Anti-acne In vivo, Anti-inflammatory, Antioxidant	Alkaloids, , , furochromones, glycerol, fatty oils, linolenic acid, myristic acid, nootkatone, starch, saponins, sesquiterpenes, cyperol sitosterol, stearic acid, terpenoids, polyphenol, and valencene	[243-245]
<i>Glehnia littoralis</i> Fr. Schmidt ex Miq.	Beach silvertop	Root	-	Antimicrobial, Antioxidant, Anti-inflammatory	Coumarins, coumarin glycosides and polyacetylenes	[246-249]
<i>Humulus lupulus</i> L.	Hop	Flower	Healing wounds and skin infections	Antimicrobial, Antioxidant	Xanthohumol, lupulones & humulones	[250]
<i>Impatiens balsamina</i> L.	Rose balsam	Leaf	Warts and snakebite	Antimicrobial	Flavonoids like kaempferol and quercetin lawsone, lawsone methyl ether, and methylene-3,30-bilawsone	[251,252]
<i>Juglans regia</i> L.	Walnut	Walnut seed husk	Externally, the seeds are pulverized into a paste and applied as a poultice to areas of dermatitis and eczema	Antimicrobial, Anti-inflammatory, Antioxidant	Hydrolysable tannins and naphthoquinones, naphthalenones, α -tetralones, and α -tetralone dimers, hydroxybenzoic acids, hydroxycinnamic acids, flavonoids, diarylheptanoids, ceramides, alkanes, steroids, triterpenoids, sesquiterpenes, and neolignans	[253-255]
<i>Mitchella repens</i> L.	Partridge berry	Leaf	Astringent skin wash.	Hormone-balancing herbs	NA	[10]
<i>Myrtus communis</i> L.	Myrtle	Leaf	Topical disinfectant, astringent, vaginal douch, and mouth gargles	Antimicrobial	5-Acetoxy-4-hydroxy-4-isobutyl-2,2,6,6-tetramethylcyclohexan-1,3-dione, β -sitosterol, isomyrtucommulone-B, endoperoxide-G-3-hormone, gallic acid, myricetin-3-O-	[47]

Herb	Common names	Part used	Traditional uses	Reported biological activities	Active constituents	Ref.
					α -l-rhamnoside, myricetin-3-O- β -d-glucoside, myricetin-3-O- β -d-galactoside-6'-O-gallate	
<i>Phellodendron chinense</i> Schneid. or <i>Phellodendron amurense</i> Rupr.	Cortex Phellodendri	Cortex	Acne	Antimicrobial, Anti-inflammatory, Anti-acne In vivo	Alkaloids (berberine, palmatine, and jatrorrhizine), isoquinoline alkaloid, limonoids, phenolic acid, quinic acid, lignans, and quercetin	[105,256-259]
<i>Rauwolfia serpentina</i> L. Benth. ex Kurz.	Indian Snakeroot	Root	Acne and skin diseases	Anti-acne activity	Alkaloids (reserpine, ajmaline, serpentine), phenolics, flavonoids	[260,261]
<i>Rhodomyrtus tomentosa</i> (Aiton.)	Australia Murta	Leaf	Abscesses, skin-whitening, anti-aging and skin beautifying agents.	Antimicrobial, Anti-acne in-vivo	Rhodomyrtone	[262,263]
<i>Salmalia malabarica</i> Schott	Shalmali	Aerial parts	Various skin troubles, especially paste of thorns, work out on <i>Acne vulgaris</i>	Antimicrobial, Anti-inflammatory, Antioxidant	β - Sitosterol, β - sitosterol glycoside, hentriacontane, hentriacontanol, quercetin and kaempferol	[264-266]
<i>Sargassum macrocarpum</i> C.Agardh	Marine brown alga			Antimicrobial	Sargafuran	[267]
<i>Saussurea lappa</i> Clarke	Costus or Kuth root	Root	Inflammatory skin diseases	Antimicrobial, Anti-inflammatory, Anti-acne in vivo	Costunolide, dehydrocostus lactone, cynaropicrin, lappadilactone, germacrenes	[238,268-270]
<i>Serenoa repens</i> (W. Bartram)	Saw palmetto	Fruit	-	Anti-androgen, Anti-inflammatory, Anti-acne In vivo	Flavonoid, phosphoglycerides plant sterols and fatty acids, mainly lauric acid	[271-273]
<i>Taraxacum officinale</i> (Weber) ex Wigg	Dandelion	Leaf and root	Boils, blisters	Anti-inflammatory, Antioxidant, Antimicrobial	Butyrolactones, butanoates namely taraxioside A-F	[274-278]
<i>Tinospora cordifolia</i> (Willd.) Hook.f.and Thoms.	Heartleaf moonseed	Root	Skin diseases	Anti-acne In vivo, Antioxidant	Alkaloids, terpenoids, lignans, steroids	[279,280]
<i>Verbena</i> spp.	Vervain	Flower top	Inflammatory disorders, skinburns, abrasions	Antimicrobial, Anti-lipase, Antioxidant, Anti-inflammatory	NA	[281-283]
<i>Vitex agnus castus</i> L.	Chasteberry	Fruit	Mild skin rash; increased acne	Anti-acne	Sabinene, 1, 8-cineole, α -pinene. flavonoids (casticin, luteolin, apigenin) iridoid glycosides (agnuside and aucubin) diterpenes (vitexilactone, rotundifuran, vitetrifolin D) diterpene lactam (vitex lactam A), and fatty acids (linoleic and oleic acid)	[5,284,285]
<i>Vitex negundo</i> L.	Chinese chaste- tree	Leaves	Skin diseases	Anti-acne In vivo, Antimicrobial, Anti-inflammatory, Antioxidant, Anti-androgen	Negundoside, agnuside, vitegnoside, 7,8 dimethyl herbacetin 3-rhamnoside, flavonoids, volatile constituents: viridiflorol, β -caryophyllene, sabinene, 4-terpineol, γ -terpinene, caryophyllene oxide, 1-oceten-3-ol, globulol	[286-290]

4. Conclusion

Conventional treatment of acne has been used for a long time. The extensive use of antibiotics led to the emergence of resistance in acne-related pathogens. Isotretinoin is effective in all stages of acne pathogenesis, yet it demonstrates various adverse effects and is teratogenic. Moreover, the high cost of conventional treatment of acne presents another drawback. Herbal

medicine has been used effectively since ancient times in acne treatment. The efficacy of such herbs is not only due to their anti-bacterial activity but also their influence on androgenicity, increased sebum activity, inflammation, and hyperkeratinization associated with acne.

Based on the above data, it could be deduced that the class of phenolic constituents demonstrated the highest anti-acne potential among the investigated phytoconstituents. The terpenoids followed this class, demonstrating promising activity against acne and acting by different mechanisms. As for the alkaloids, berberine was the most prominent from various plants with an anti-acne effect.

Many herbs with a history of use in traditional cultures have entered the growing ‘cosmeceuticals’ market due to the advantages of better patient tolerance, long history of use, fewer side effects, and being relatively more cost-effective. Herbal extracts may be used alone or as adjuvants. Novel drug delivery systems such as microemulsion, liposomal, and nano-formulations can improve the drug delivery of herbal extracts or oil to reduce their associated side effects. This creates extensive interest in developing such formulations, thus flourishing the pharmaceutical industry.

The present review provides extensive and updated research on the anti-acne properties of medicinal plants and their phytoconstituents. This work provides a useful bibliography for further preclinical and clinical investigations and encourages the pharmaceutical industry to invest in the natural treatment of acne projects.

Funding

This research received no external funding.

Acknowledgments

This research has no acknowledgment.

Conflicts of Interest

The authors declare no conflict of interest.

References

1. Tuchayi, S.M.; Makrantonaki, E.; Ganceviciene, R.; Dessinioti, C.; Feldman, S.R.; Zouboulis, C.C. *Acne vulgaris*. *Nature Reviews Disease Primers* **2015**, *1*, 1-20, <https://doi.org/10.1038/nrdp.2015.29>.
2. Leung, A.K.; Barankin, B.; Lam, J.M.; Leong, K.F.; Hon, K.L. Dermatology: how to manage *Acne vulgaris*. *Drugs in context* **2021**, *10*, <https://dx.doi.org/10.7573%2Fdic.2021-8-6>.
3. Kapoor, S.; Saraf, S.J.R.J.M.P. Topical herbal therapies an alternative and complementary choice to combat acne. *Research Journal of Medicinal Plants* **2011**, *5*, 650-659, <https://dx.doi.org/10.3923/rjmp.2011.650.669>.
4. Vos, T.; Flaxman, A.D.; Naghavi, M.; Lozano, R.; Michaud, C.; Ezzati, M.; Shibuya, K.; Salomon, J.A.; Abdalla, S.; Aboyans, V. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The lancet* **2012**, *380*, 2163-2196, [https://doi.org/10.1016/S0140-6736\(12\)61729-2](https://doi.org/10.1016/S0140-6736(12)61729-2).
5. Nasri, H.; Bahmani, M.; Shahinfard, N.; Nafchi, A.M.; Saberianpour, S.; Kopaei, M.R. Medicinal plants for the treatment of *Acne vulgaris*: A review of recent evidences. *Jundishapur Journal of Microbiology* **2015**, *8*, <https://dx.doi.org/10.5812/jjm.25580>.
6. Bickers, D.R.; Lim, H.W.; Margolis, D.; Weinstock, M.A.; Goodman, C.; Faulkner, E.; Gould, C.; Gemmen, E.; Dall, T.J.J.o.t.A.A.o.D. The burden of skin diseases: 2004: A joint project of the American Academy of Dermatology Association and the Society for Investigative Dermatology. *Journal of the American Academy of Dermatology* **2006**, *55*, 490-500, <https://doi.org/10.1016/j.jaad.2006.05.048>.
7. Chen, S. *Herbology in Three Traditional Medicines for Acne*. Xlibris Corporation: **2011**.
8. Fox, L.; Csongradi, C.; Aucamp, M.; Du Plessis, J.; Gerber, M.J.M. Treatment modalities for acne. *Molecules* **2016**, *21*, <https://doi.org/10.3390/molecules21081063>.

9. Weller, R.; Hunter, H.; Mann, M. Sebaceous and Sweat Gland Disorders. *Clinical Dermatology*; 5th ed.; JohnWiley & Sons Ltd., 2014; pp. 156-170. <https://doi.org/10.1002/9781118938164.ch12>
10. Yarnell, E.; Abascal, K.J.A.; Therapies, C. Herbal medicine for *Acne vulgaris*. *Alternative and Complementary Therapies* **2006**, *12*, 303-309, <https://doi.org/10.1089/act.2006.12.303>.
11. Karadag, A.; Aslan Kayiran, M.; Wu, C.Y.; Chen, W.; Parish, L. Antibiotic resistance in acne: changes, consequences and concerns. *Journal of the European Academy of Dermatology and Venereology* **2021**, *35*, 73-78, <https://doi.org/10.1111/jdv.16686>.
12. Bashir, A.; Saeed, B.; Mujahid, T.Y.; Jehan, N. Comparative study of antimicrobial activities of Aloe vera extracts and antibiotics against isolates from skin infections. *African Journal of Biotechnology* **2011**, *10*, 3835-3840.
13. Surjushe, A.; Vasani, R.; Saple, D. Aloe vera: a short review. *Indian journal of dermatology* **2008**, *53*, <https://doi.org/10.4103/0019-5154.44785>.
14. Lalla, J.; Nandedkar, S.; Paranjape, M.; Talreja, N. Clinical trials of ayurvedic formulations in the treatment of *Acne vulgaris*. *Journal of ethnopharmacology* **2001**, *78*, 99-102, [https://doi.org/10.1016/S0378-8741\(01\)00323-3](https://doi.org/10.1016/S0378-8741(01)00323-3).
15. Parveen, S.; Zafar, S.; Qureshi, M.; Bano, H. Clinical trial of Unani herbomineral cream to evaluate its topical effects on *Acne vulgaris*. *Indian journal of traditional knowledge* **2009**, *8*.
16. Rajeswari, R.; Umadevi, M.; Rahale, C.S.; Pushpa, R.; Selvavenkadesh, S.; Kumar, K.S.; Bhowmik, D. Aloe vera: the miracle plant its medicinal and traditional uses in India. *Journal of Pharmacognosy and Phytochemistry* **2012**, *1*, 118-124.
17. Iraj, F.; Aghaei, A.; Motamedi, R.; Siahpoosh, A.; Karami, M.A. Comparison of Topical Herbal Cream and 1% Clindamycin Gel for Treatment of Mild-to-moderate Acne: A Randomized Clinical Trial. *Jundishapur Journal of Natural Pharmaceutical Products* **2021**, <https://dx.doi.org/10.5812/jjnpp.114810>.
18. Cooposamy, R.; Naidoo, K. An ethnobotanical study of medicinal plants used by traditional healers in Durban, South Africa. *African Journal of Pharmacy and Pharmacology* **2012**, *6*, 818-823.
19. Jeong, W.Y.; Kim, K. Anti-Propionibacterium acnes and the anti-inflammatory effect of Aloe ferox miller components. *Journal of Herbal Medicine* **2017**, *9*, 53-59, <https://doi.org/10.1016/j.hermed.2017.03.009>.
20. Chen, W.; Van Wyk, B.-E.; Vermaak, I.; Viljoen, A.M. Cape aloes—a review of the phytochemistry, pharmacology and commercialisation of Aloe ferox. *Phytochemistry Letters* **2012**, *5*, 1-12, <https://doi.org/10.1016/j.phytol.2011.09.001>.
21. Miglani, A.; Manchanda, R.K. Observational study of Arctium lappa in the treatment of *Acne vulgaris*. *Homeopathy* **2014**, *103*, 203-207, <https://doi.org/10.1016/j.homp.2013.12.002>.
22. Chan, Y.-S.; Cheng, L.-N.; Wu, J.-H.; Chan, E.; Kwan, Y.-W.; Lee, S.M.-Y.; Leung, G.P.-H.; Yu, P.H.-F.; Chan, S.-W. A review of the pharmacological effects of Arctium lappa (burdock). *Inflammopharmacology* **2011**, *19*, 245-254, <https://doi.org/10.1007/s10787-010-0062-4>.
23. Park, S.Y.; Hong, S.S.; Han, X.H.; Hwang, J.S.; Lee, D.; Ro, J.S.; Hwang, B.Y. Lignans from Arctium lappa and their inhibition of LPS-induced nitric oxide production. *Chemical and pharmaceutical bulletin* **2007**, *55*, 150-152, <https://doi.org/10.1248/cpb.55.150>.
24. Nayak, M.; Nagarajan, A.; Majeed, M.; Nagabhushanam, K.; Choudhury, A.K. In vitro anti-acne activity of phytoactives from the stem bark of *Artocarpus hirsutus* Lam. and characterisation of pyranocycloartobioxanthone A as a mixture of two anomers. *Natural product research* **2018**, *32*, 2116-2120, <https://doi.org/10.1080/14786419.2017.1365068>.
25. Dej-Adisai, S.; Meechai, I.; Puripattanavong, J.; Kummee, S. Antityrosinase and antimicrobial activities from Thai medicinal plants. *Archives of Pharmacal Research* **2014**, *37*, 473-483, <https://doi.org/10.1007/s12272-013-0198-z>.
26. Imenshahidi, M.; Hosseinzadeh, H. Berberis vulgaris and berberine: an update review. *Phytotherapy research* **2016**, *30*, 1745-1764, <https://doi.org/10.1002/ptr.5693>.
27. Ivanovska, N.; Philipov, S. Study on the anti-inflammatory action of Berberis vulgaris root extract, alkaloid fractions and pure alkaloids. *International journal of immunopharmacology* **1996**, *18*, 553-561, [https://doi.org/10.1016/S0192-0561\(96\)00047-1](https://doi.org/10.1016/S0192-0561(96)00047-1).
28. Fouladi, R.F. Aqueous extract of dried fruit of Berberis vulgaris L. in *Acne vulgaris*, a clinical trial. *Journal of dietary supplements* **2012**, *9*, 253-261, <https://doi.org/10.3109/19390211.2012.726702>.
29. Rahimi-Madiseh, M.; Lorigoini, Z.; Zamani-Gharaghoshi, H.; Rafieian-Kopaei, M. Berberis vulgaris: specifications and traditional uses. *Iranian Journal of Basic Medical Sciences* **2017**, *20*, <https://doi.org/10.22038/IJBMS.2017.8690>.
30. Och, A.; Podgórski, R.; Nowak, R. Biological Activity of Berberine—A Summary Update. *Toxins* **2020**, *12*, <https://doi.org/10.3390/toxins12110713>.
31. Batubara, I.; Mitsunaga, T. Use of Indonesian medicinal plants products against acne. *Reviews in Agricultural Science* **2013**, *1*, 11-30, <https://doi.org/10.7831/ras.1.11>.
32. Batubara, I.; Mitsunaga, T.; Ohashi, H. Brazilin from *Caesalpinia sappan* wood as an antiacne agent. *Journal of wood science* **2010**, *56*, 77-81, <https://doi.org/10.1007/s10086-009-1046-0>.
33. Nand, P.; Drabu, S.; Gupta, R. Phytochemical and antimicrobial screening of medicinal plants for the treatment of acne. *Indian Journal of Natural Products and Resources* **2012**.

34. Chen, B.-T.; Li, W.-X.; He, R.-R.; Li, Y.-F.; Tsoi, B.; Zhai, Y.-J.; Kurihara, H. Anti-inflammatory effects of a polyphenols-rich extract from tea (*Camellia sinensis*) flowers in acute and chronic mice models. *Oxidative medicine and cellular longevity* **2012**, 2012, <https://doi.org/10.1155/2012/537923>.
35. Kim, S.; Park, T.H.; Kim, W.I.; Park, S.; Kim, J.H.; Cho, M.K. The effects of green tea on *Acne vulgaris*: A systematic review and meta-analysis of randomized clinical trials. *Phytotherapy Research* **2020**, <https://doi.org/10.1002/ptr.6809>.
36. Liao, S.; Hiipakka, R.A. Selective-Inhibition of steroid 5 α -reductase isozymes by tea epicatechin-3-gallate and epigallocatechin-3-gallate. *Biochemical and biophysical research communications* **1995**, 214, 833-838, <https://doi.org/10.1006/bbrc.1995.2362>.
37. Lee, J.H.; Shim, J.S.; Chung, M.S.; Lim, S.T.; Kim, K.H. In vitro anti-adhesive activity of green tea extract against pathogen adhesion. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives* **2009**, 23, 460-466, <https://doi.org/10.1002/ptr.2609>.
38. Yoon, J.Y.; Kwon, H.H.; Min, S.U.; Thiboutot, D.M.; Suh, D.H. Epigallocatechin-3-gallate improves acne in humans by modulating intracellular molecular targets and inhibiting *P. acnes*. *Journal of Investigative Dermatology* **2013**, 133, 429-440, <https://doi.org/10.1038/jid.2012.292>.
39. Lin, Y.-Y.; Lu, S.-H.; Gao, R.; Kuo, C.-H.; Chung, W.-H.; Lien, W.-C.; Wu, C.-C.; Diao, Y.; Wang, H.-M.D. A Novel Biocompatible Herbal Extract-Loaded Hydrogel for Acne Treatment and Repair. *Oxidative medicine and cellular longevity* **2021**, 2021, <https://doi.org/10.1155/2021/5598291>.
40. Zhu, Z. Observation of therapeutic effect of *Acne vulgaris* with the herb of Cuo Chuang Prescription. *Chinese Journal of Dermatovenereology* **2007**, 21, 31-311.
41. Mandade, R.; Sreenivas, S.; Choudhury, A. Radical scavenging and antioxidant activity of *Carthamus tinctorius* extracts. *Free Radicals and Antioxidants* **2011**, 1, 87-93, <https://doi.org/10.5530/ax.2011.3.12>.
42. Sahu, M.A.K. Master of Pharmacy In Pharmacognosy. KLE University, **2011**.
43. Shafiq, Y.; Naqvi, B.S.; Rizwani, G.H.; Usman, M.; Shah, B.A.; Hina, B. Anti-acne activity of *Casuarina equisetifolia* bark extract: A randomized clinical trial. *Bangladesh Journal of Pharmacology* **2014**, 9, 337-341, <https://doi.org/10.3329/bjp.v9i3.19342>.
44. Zhang, S.-J.; Lin, Y.-M.; Zhou, H.-C.; Wei, S.-D.; Lin, G.-H.; Ye, G.-F. Antioxidant tannins from stem bark and fine root of *Casuarina equisetifolia*. *Molecules* **2010**, 15, 5658-5670, <https://doi.org/10.3390/molecules15085658>.
45. Ogunwande, I.; Flamini, G.; Adefuye, A.; Lawal, N.; Moradeyo, S.; Avoseh, N. Chemical compositions of *Casuarina equisetifolia* L., *Eucalyptus toreliana* L. and *Ficus elastica* Roxb. ex Hornem cultivated in Nigeria. *South African Journal of Botany* **2011**, 77, 645-649, <https://doi.org/10.1016/j.sajb.2011.02.001>.
46. Jain, A.; Basal, E. Inhibition of *Propionibacterium acnes*-induced mediators of inflammation by Indian herbs. *Phytomedicine* **2003**, 10, 34-38, <https://doi.org/10.1078/094471103321648638>.
47. Hamdy, A.; Kassem, H.; Awad, G.; El-Kady, S.; Benito, M.T.; Doyagüez, E.; Jimeno, M.; Lall, N.; Hussein, A.A. In-vitro evaluation of certain Egyptian traditional medicinal plants against *Propionibacterium acnes*. *South African Journal of Botany* **2017**, 109, 90-95, <https://doi.org/10.1016/j.sajb.2016.12.026>.
48. Maizura, M.; Aminah, A.; Wan Aida, W. Total phenolic content and antioxidant activity of kesum (*Polygonum minus*), ginger (*Zingiber officinale*) and turmeric (*Curcuma longa*) extract. *International Food Research Journal* **2011**, 17, 45-53.
49. Lee, J.-H.; Eom, S.-H.; Lee, E.-H.; Jung, Y.-J.; Kim, H.-J.; Jo, M.-R.; Son, K.-T.; Lee, H.-J.; Kim, J.H.; Lee, M.-S. In vitro antibacterial and synergistic effect of phlorotannins isolated from edible brown seaweed *Eisenia bicyclis* against acne-related bacteria. *Algae* **2014**, 29, 47-55, <https://doi.org/10.4490/algae.2014.29.1.047>.
50. Jung, H.A.; Jin, S.E.; Ahn, B.R.; Lee, C.M.; Choi, J.S. Anti-inflammatory activity of edible brown alga *Eisenia bicyclis* and its constituents fucosterol and phlorotannins in LPS-stimulated RAW264. 7 macrophages. *Food and chemical toxicology* **2013**, 59, 199-206, <https://doi.org/10.1016/j.fct.2013.05.061>.
51. Prasad, S.B.; Bist, M. In vitro anti acne activity of methanolic extract of dried fruit of *Embelia ribes*. *Int J Pharm Quality Assurance* **2018**, 9, 90-94, <https://doi.org/10.25258/ijpqa.v9i01.11921>.
52. Guo, S.; He, M.; Liu, M.; Huang, W.; Ouyang, H.; Feng, Y.; Zhong, G.; Yang, S. Chemical Profiling of *Embelia ribes* by Ultra-High-Performance Liquid Chromatography Quadrupole Time-of-Flight Tandem Mass Spectrometry and Its Antioxidant and Anti-inflammatory Activities In Vitro. *Journal of chromatographic science* **2020**, 58, 241-250, <https://doi.org/10.1093/chromsci/bmz097>.
53. Patil, V.; Bandivadekar, A.; Debjani, D. Inhibition of *Propionibacterium acnes* lipase by extracts of Indian medicinal plants. *International journal of cosmetic science* **2012**, 34, 234-239, <https://doi.org/10.1111/j.1468-2494.2012.00706.x>.
54. Revan, K.; Mahendrakumar, C.; Kiran, B. Evaluation of anti-acne activity of hydroalcoholic extract of *Embelia ribes* Burm. *International Journal of Pharmacognosy and Phytochemistry Research* **2010**, 7, 1116-1120.
55. Kumar, K.S.; Bhowmik, D.; Dutta, A.; Yadav, A.P.; Paswan, S.; Srivastava, S.; Deb, L. Recent trends in potential traditional Indian herbs *Embelia officinalis* and its medicinal importance. *Journal of Pharmacognosy and Phytochemistry* **2012**, 1, 18-28.

56. Paranjpe, P.; Kulkarni, P. Comparative efficacy of four Ayurvedic formulations in the treatment of *Acne vulgaris*: a double-blind randomised placebo-controlled clinical evaluation. *Journal of ethnopharmacology* **1995**, *49*, 127-132, [https://doi.org/10.1016/0378-8741\(95\)01309-1](https://doi.org/10.1016/0378-8741(95)01309-1).
57. Muthuraman, A.; Sood, S.; Singla, S.K. The antiinflammatory potential of phenolic compounds from *Emblica officinalis* L. in rat. *Inflammopharmacology* **2011**, *19*, 327-334, <https://doi.org/10.1007/s10787-010-0041-9>.
58. Bhattacharya, A.; Chatterjee, A.; Ghosal, S.; Bhattacharya, S.K. Antioxidant activity of active tannoid principles of *Emblica officinalis* (amla). *NIScPR Online Periodicals Repository* **1999**.
59. Kumaran, A.; Karunakaran, R.J. Nitric oxide radical scavenging active components from *Phyllanthus emblica* L. *Plant Foods for Human Nutrition* **2006**, *61*, <https://doi.org/10.1007/s11130-006-0001-0>.
60. Coenye, T.; Brackman, G.; Rigole, P.; De Witte, E.; Honraet, K.; Rossel, B.; Nelis, H.J. Eradication of *Propionibacterium acnes* biofilms by plant extracts and putative identification of icariin, resveratrol and salidroside as active compounds. *Phytomedicine* **2012**, *19*, 409-412, <https://doi.org/10.1016/j.phymed.2011.10.005>.
61. Takahashi, T.; Kokubo, R.; Sakaino, M. Antimicrobial activities of eucalyptus leaf extracts and flavonoids from *Eucalyptus maculata*. *Letters in applied microbiology* **2004**, *39*, 60-64, <https://doi.org/10.1111/j.1472-765X.2004.01538.x>.
62. Reddy, L.; Spandana, G.; Beena, J.; Jalli, R. Evaluation of antibacterial & DPPH radical scavenging activities of the leaf essential oils of *Pongamia pinnata* & *Eucalyptus maculata*. *Asian Journal of Biochemical and Pharmaceutical Research* **2012**, *2*, 25-32.
63. Leelapornpisid, P.; Chansakao, S.; Ittiwittayawat, T.; Pruksakorn, S. Antimicrobial activity of herbal extracts on *Staphylococcus aureus* and *Propionibacterium acnes*. In: Proceedings of the III WOCMAP Congress on Medicinal and Aromatic Plants-Volume 5: Quality, Efficacy, Safety, Processing and Trade in Medicinal 679, **2003**; pp. 97-104.
64. Mapunya, M.B.; Hussein, A.A.; Rodriguez, B.; Lall, N. Tyrosinase activity of *Greyia flanaganii* (Bolus) constituents. *Phytomedicine* **2011**, *18*, 1006-1012, <https://doi.org/10.1016/j.phymed.2011.03.013>.
65. Pan-In, P.; Wongsomboon, A.; Kokpol, C.; Chaichanawongsaroj, N.; Wanichwecharungruang, S. Depositing α -mangostin nanoparticles to sebaceous gland area for acne treatment. *Journal of pharmacological sciences* **2015**, *129*, 226-232, <https://doi.org/10.1016/j.jphs.2015.11.005>.
66. Yang, J.H.; Hwang, E.J.; Moon, J.; Yoon, J.Y.; Kim, J.W.; Choi, S.; Cho, S.I.; Suh, D.H. Clinical efficacy of herbal extracts in treatment of mild to moderate *Acne vulgaris*: an 8-week, double-blinded, randomized, controlled trial. *Journal of Dermatological Treatment* **2021**, *32*, 297-301, <https://doi.org/10.1080/09546634.2019.1657792>.
67. Batubara, I.; Kuspradini, H.; Muddathir, A.M.; Mitsunaga, T. *Intsia palembanica* wood extracts and its isolated compounds as *Propionibacterium acnes* lipase inhibitor. *Journal of wood science* **2014**, *60*, 169-174, <https://doi.org/10.1007/s10086-013-1388-5>.
68. Azahar, M.; Uddin, Q.; Kazmi, M.H.; Khatoun, F.; Husain, N. Therapeutic Evaluation of a Topical Unani Formulation, *Tila-i Muhāsā* in *Buthūr Labaniyya (Acne Vulgaris)*: A Randomized, Controlled Clinical Study. *CellMed* **2020**, *10*, 15.11-15.19, <https://doi.org/10.5667/CellMed.2020.0015>.
69. Ganaie, A.A.; Mishra, R.P.; Allaie, A.H. Antioxidant activity of some extracts of *Iris ensata*. *Journal of Pharmacognosy and Phytochemistry* **2018**, *7*, 230-235.
70. Kaššák, P. Total flavonoids and phenolics content of the chosen genus *Iris* species. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* **2013**, *60*, 119-126, <http://dx.doi.org/10.11118/actaun201260080119>.
71. Song, M.-S.; Shim, J.-S.; Gwon, S.-H.; Lee, C.-W.; Kim, H.-S.; Hwang, J.-K. Antibacterial activity of panduratin A and isopanduratin A isolated from *Kaempferia pandurata* Roxb. against acne-causing microorganisms. *Food Science and Biotechnology* **2008**, *17*, 1357-1360.
72. Zu, Y.; Yu, H.; Liang, L.; Fu, Y.; Efferth, T.; Liu, X.; Wu, N. Activities of ten essential oils towards *Propionibacterium acnes* and PC-3, A-549 and MCF-7 cancer cells. *Molecules* **2010**, *15*, 3200-3210, <https://doi.org/10.3390/molecules15053200>.
73. Moon, T.; Wilkinson, J.; Cavanagh, H. Antibacterial activity of essential oils, hydrosols and plant extracts from Australian grown *Lavandula* spp. *International Journal of Aromatherapy* **2006**, *16*, 9-14, <https://doi.org/10.1016/j.ijat.2006.01.007>.
74. Algeri, F.; Rodriguez-Nogales, A.; Vezza, T.; Garrido-Mesa, J.; Garrido-Mesa, N.; Utrilla, M.P.; González-Tejero, M.R.; Casares-Porcel, M.; Molero-Mesa, J.; del Mar Contreras, M. Anti-inflammatory activity of hydroalcoholic extracts of *Lavandula dentata* L. and *Lavandula stoechas* L. *Journal of ethnopharmacology* **2016**, *190*, 142-158, <https://doi.org/10.1016/j.jep.2016.05.063>.
75. Ezzoubi, Y.; Bousta, D.; Lachkar, M.; Farah, A. Antioxidant and anti-inflammatory properties of ethanolic extract of *Lavandula stoechas* L. from Taounate region in Morocco. *International Journal of Phytopharmacology* **2014**, *5*, 21-26.
76. Karabagias, I.K.; Karabagias, V.K.; Riganakos, K.A. Physico-chemical parameters, phenolic profile, in vitro antioxidant activity and volatile compounds of *ladastacho (Lavandula stoechas)* from the region of Saidona. *Antioxidants* **2019**, *8*, <https://doi.org/10.3390/antiox8040080>.

77. Pampaniya, P.V.; Pandya, D.H. Effect of Shalmalyadilepa and Guduchyadivati in the management of Yauvanapidika (Acne). *Ayu* **2013**, *34*, <https://doi.org/10.4103/0974-8520.119673>.
78. Shukla, A.; Shukla, R.; Rai, G. Preliminary investigations on Med. Seeds for anti-inflammatory and Lens culinaris antioxidant properties. *Asian Journal of Pharmacy and Pharmacology* **2017**, *3*, 29-31.
79. Zou, Y.; Chang, S.K.; Gu, Y.; Qian, S.Y. Antioxidant activity and phenolic compositions of lentil (*Lens culinaris* var. Morton) extract and its fractions. *Journal of agricultural and food chemistry* **2011**, *59*, 2268-2276, <https://doi.org/10.1021/jf104640k>.
80. Park, J.; Lee, J.; Jung, E.; Park, Y.; Kim, K.; Park, B.; Jung, K.; Park, E.; Kim, J.; Park, D. In vitro antibacterial and anti-inflammatory effects of honokiol and magnolol against *Propionibacterium* sp. *European Journal of Pharmacology* **2004**, *496*, 189-195, <https://doi.org/10.1016/j.ejphar.2004.05.047>.
81. Poomanee, W.; Chaiyana, W.; Mueller, M.; Viernstein, H.; Khunkitti, W.; Leelapornpisid, P. In-vitro investigation of anti-acne properties of *Mangifera indica* L. kernel extract and its mechanism of action against *Propionibacterium acnes*. *Anaerobe* **2018**, *52*, 64-74, <https://doi.org/10.1016/j.anaerobe.2018.05.004>.
82. Seo, C.-S.; Lim, H.-S.; Jeong, S.-J.; Ha, H.; Shin, H.-K. HPLC-PDA analysis and anti-inflammatory effects of Mori Cortex Radicis. *Natural product communications* **2013**, *8*, <https://doi.org/10.1177%2F1934578X1300801027>.
83. Bayazid, A.B.; Kim, J.G.; Park, S.H.; Lim, B.O. Antioxidant, anti-inflammatory, and antiproliferative activity of Mori Cortex Radicis extracts. *Natural Product Communications* **2020**, *15*, <https://doi.org/10.1177%2F1934578X19899765>.
84. Srihaphon, K.; Wongwat, T.; Lamlerthon, S.; Pitaksuteepong, T. Investigation on the potential application of *Morus alba* stem extract for inflammatory *Acne vulgaris*. **2019**.
85. Rivière, C.; Krisa, S.; Péchamat, L.; Nassra, M.; Delaunay, J.-C.; Marchal, A.; Badoc, A.; Waffo-Téguo, P.; Méryllon, J.-M. Polyphenols from the stems of *Morus alba* and their inhibitory activity against nitric oxide production by lipopolysaccharide-activated microglia. *Fitoterapia* **2014**, *97*, 253-260, <https://doi.org/10.1016/j.fitote.2014.06.001>.
86. Budiman, A.; Aulifa, D.L.; Kusuma, A.S.W.; Sulastri, A. Antibacterial and antioxidant activity of black mulberry (*Morus nigra* L.) extract for acne treatment. *Pharmacognosy Journal* **2017**, *9*, <https://doi.org/10.5530/pj.2017.5.97>.
87. Lee, C.-J.; Huang, C.-W.; Chen, L.-G.; Wang, C.-C. (+)-Erythro- Δ^8 -7S, 8R-dihydroxy-3, 3', 5'-trimethoxy-8-O-4'-neolignan, an Anti-Acne Component in Degreasing *Myristica fragrans* Houtt. *Molecules* **2020**, *25*, 4563, <https://doi.org/10.3390/molecules25194563>.
88. Kim, M.-S.; Koppula, S.; Jung, S.-H.; Kim, J.-Y.; Lee, H.-R.; Lee, S.-R.; Park, Y.-D.; Lee, K.-A.; Park, T.-K.; Kang, H. *Olea europaea* Linn (Oleaceae) fruit pulp extract exhibits potent antioxidant activity and attenuates neuroinflammatory responses in lipopolysaccharide-stimulated microglial cells. *Tropical Journal of Pharmaceutical Research* **2013**, *12*, 357-362, <https://doi.org/10.4314/tjpr.v12i3.13>.
89. Qidwai, A.; Pandey, M.; Kumar, R.; Dikshit, A. Comprehensive evaluation of pharmacological properties of *Olea europaea* L. for Cosmeceuticals prospects. *Clinical Phytoscience* **2017**, *3*, 1-7, <https://doi.org/10.1186/s40816-017-0050-y>.
90. Bhutya, R.K. *Ayurvedic Medicinal Plants of India*. Scientific Publishers: Volume 1, **2011**.
91. Kaewbumrung, S. Study on antibacterial activity against acne-involved bacteria and stability of naphthoquinone rich *Plumbago indica* root extract. *Prince of Songkla University* **2010**.
92. Fabbrocini, G.; Staibano, S.; De Rosa, G.; Battimiello, V.; Fardella, N.; Ilardi, G.; La Rotonda, M.I.; Longobardi, A.; Mazzella, M.; Siano, M. Resveratrol-containing gel for the treatment of *Acne vulgaris*. *American journal of clinical dermatology* **2011**, *12*, 133-141, <https://doi.org/10.2165/11530630-000000000-00000>.
93. Sinha, P.; Srivastava, S.; Mishra, N.; Yadav, N.P. New perspectives on antiacne plant drugs: contribution to modern therapeutics. *BioMed research international* **2014**, *2014*, <https://doi.org/10.1155/2014/301304>.
94. Tachakittirungrod, S.; Ikegami, F.; Okonogi, S. Antioxidant active principles isolated from *Psidium guajava* grown in Thailand. *Scientia pharmaceutica* **2007**, *75*, 179-193, <https://doi.org/10.3797/scipharm.2007.75.179>.
95. Lim, H.-J.; Kang, S.-H.; Song, Y.-J.; Jeon, Y.-D.; Jin, J.-S. Inhibitory Effect of Quercetin on *Propionibacterium acnes*-induced Skin Inflammation. *International Immunopharmacology* **2021**, *96*, <https://doi.org/10.1016/j.intimp.2021.107557>.
96. Lee, C.-J.; Chen, L.-G.; Liang, W.-L.; Wang, C.-C. Multiple activities of *Punica granatum* Linne against *Acne vulgaris*. *International journal of molecular sciences* **2017**, *18*, <https://doi.org/10.3390/ijms18010141>.
97. Cho, S.-C.; Sultan, M.Z.; Moon, S.-S. Anti-acne activities of pulsaquinone, hydropulsaquinone, and structurally related 1, 4-quinone derivatives. *Archives of pharmacal research* **2009**, *32*, 489-494, <https://doi.org/10.1007/s12272-009-1402-z>.
98. Koseki, J.; Matsumoto, T.; Matsubara, Y.; Tsuchiya, K.; Mizuhara, Y.; Sekiguchi, K.; Nishimura, H.; Watanabe, J.; Kaneko, A.; Hattori, T. Inhibition of rat 5α -reductase activity and testosterone-induced sebum synthesis in hamster sebocytes by an extract of *Quercus acutissima* cortex. *Evidence-Based Complementary and Alternative Medicine* **2015**, *2015*, <https://doi.org/10.1155/2015/853846>.

99. Hu, Y.; Luo, Y.; Xiang, L.; Wu, J.; Zhang, Y.; Zeng, Y.; Xu, C.; Meng, X.; Wang, P. Assessment of the anti-inflammatory effects of three rhubarb anthraquinones in LPS-Stimulated RAW264. 7 macrophages using a pharmacodynamic model and evaluation of the structure-activity relationships. *Journal of Ethnopharmacology* **2021**, *273*, <https://doi.org/10.1016/j.jep.2021.114027>.
100. Nguyen, A.T.; Kim, K.-Y. Rhein inhibits the growth of *Propionibacterium acnes* by blocking NADH dehydrogenase-2 activity. *Journal of medical microbiology* **2020**, *69*, 689-696, <https://doi.org/10.1099/jmm.0.001196>.
101. Reddy, D.M.; Jain, V. An overview on medicinal plants for the treatment of acne. *Journal of Critical Reviews* **2019**, *6*, 7-14.
102. Puttarak, P.; Charoonratana, T.; Panichayupakaranant, P. Antimicrobial activity and stability of rhinacanthins-rich *Rhinacanthus nasutus* extract. *Phytomedicine* **2010**, *17*, 323-327, <https://doi.org/10.1016/j.phymed.2009.08.014>.
103. Khan, K.; Karodi, R.; Siddiqui, A.; Thube, S.; Rub, R. Development of anti-acne gel formulation of anthraquinones rich fraction from *Rubia cordifolia* (Rubiaceae). *International Journal of Applied Research in Natural Products* **2011**, *4*, 28-36.
104. Vora, J.; Srivastava, A.; Modi, H. Antibacterial and antioxidant strategies for acne treatment through plant extracts. *Informatics in Medicine unlocked* **2018**, *13*, 128-132, <https://doi.org/10.1016/j.imu.2017.10.005>.
105. Tsai, T.-H.; Chuang, L.-T.; Lien, T.-J.; Liing, Y.-R.; Chen, W.-Y.; Tsai, P.-J. Rosmarinus officinalis extract suppresses *Propionibacterium acnes*-induced inflammatory responses. *Journal of medicinal food* **2013**, *16*, 324-333, <https://doi.org/10.1089/jmf.2012.2577>.
106. Budhiraja, A.; Dhingra, G. Development and characterization of a novel antiacne niosomal gel of rosmarinic acid. *Drug Delivery* **2014**, *22*, 723-730, <https://doi.org/10.3109/10717544.2014.903010>.
107. Guo, M.; An, F.; Wei, X.; Hong, M.; Lu, Y. Comparative effects of schisandrin A, B, and C on acne-related inflammation. *Inflammation* **2017**, *40*, 2163-2172, <https://doi.org/10.1007/s10753-017-0656-8>.
108. Huang, W.-H.; Lee, A.-R.; Yang, C.-H. Antioxidative and anti-inflammatory activities of polyhydroxyflavonoids of *Scutellaria baicalensis* GEORGI. *Bioscience, biotechnology, and biochemistry* **2006**, *70*, 2371-2380, <https://doi.org/10.1271/bbb.50698>.
109. Tsai, P.-J.; Huang, W.-C.; Hsieh, M.-C.; Sung, P.-J.; Kuo, Y.-H.; Wu, W.-H. Flavones isolated from *scutellariae radix* suppress *propionibacterium acnes*-induced cytokine production in vitro and in vivo. *Molecules* **2016**, *21*, <https://doi.org/10.3390/molecules21010015>.
110. Choi, W.; No, R.H.; Kwon, H.-S.; Lee, H.Y. Enhancement of skin anti-inflammatory activities of *Scutellaria baicalensis* extract using a nanoencapsulation process. *Journal of Cosmetic and Laser Therapy* **2014**, *16*, 271-278, <https://doi.org/10.3109/14764172.2014.946051>.
111. Yanhua, Z.Y.L. Treatment of Common Acne by Chinese Herbal Medicine Associated with Acne Clearance Technique: A Clinical Observation of 80 Cases. *New Journal of Traditional Chinese Medicine* **2007**, *1*.
112. Chi, Y.S.; Lim, H.; Park, H.; Kim, H.P. Effects of wogonin, a plant flavone from *Scutellaria radix*, on skin inflammation: in vivo regulation of inflammation-associated gene expression. *Biochemical pharmacology* **2003**, *66*, 1271-1278, [https://doi.org/10.1016/S0006-2952\(03\)00463-5](https://doi.org/10.1016/S0006-2952(03)00463-5).
113. Nigam, M.; Mishra, A.P.; Adhikari-Devkota, A.; Dirar, A.I.; Hassan, M.M.; Adhikari, A.; Belwal, T.; Devkota, H.P. Fruits of *Terminalia chebula* Retz.: A review on traditional uses, bioactive chemical constituents and pharmacological activities. *Phytotherapy Research* **2020**, *34*, 2518-2533, <https://doi.org/10.1002/ptr.6702>.
114. Saenprakob, P., & Saengmanee, K. Development of Facial Cleansing Anti-Acne Gel Formulation Using *Terminalia chebula* Extract, *Wichcha Journal Nakhon Si Thammarat Rajabhat University*. 2020 Dec 21;39(2):87-100.
115. Bag, A.; Kumar Bhattacharyya, S.; Kumar Pal, N.; Ranjan Chattopadhyay, R. Anti-inflammatory, anti-lipid peroxidative, antioxidant and membrane stabilizing activities of hydroalcoholic extract of *Terminalia chebula* fruits. *Pharmaceutical Biology* **2013**, *51*, 1515-1520, <https://doi.org/10.3109/13880209.2013.799709>.
116. Vijayalakshmi, A.; Tripura, A.; Ravichandiran, V. Development and evaluation of anti-acne products from *Terminalia arjuna* bark. *Int J Chem Tech Res* **2011**, *3*, 320-327.
117. Mandal, S.; Patra, A.; Samanta, A.; Roy, S.; Mandal, A.; Mahapatra, T.D.; Pradhan, S.; Das, K.; Nandi, D.K. Analysis of phytochemical profile of *Terminalia arjuna* bark extract with antioxidative and antimicrobial properties. *Asian Pacific journal of tropical biomedicine* **2013**, *3*, 960-966, [https://doi.org/10.1016/S2221-1691\(13\)60186-0](https://doi.org/10.1016/S2221-1691(13)60186-0).
118. Kokkiripati, P.K.; Kamsala, R.V.; Bashyam, L.; Manthapuram, N.; Bitla, P.; Peddada, V.; Raghavendra, A.S.; Tetali, S.D. Stem-bark of *Terminalia arjuna* attenuates human monocytic (THP-1) and aortic endothelial cell activation. *Journal of ethnopharmacology* **2013**, *146*, 456-464, <https://doi.org/10.1016/j.jep.2012.12.050>.
119. Muddathir, A.M.; Yamauchi, K.; Mitsunaga, T. Anti-acne activity of tannin-related compounds isolated from *Terminalia laxiflora*. *Journal of wood science* **2013**, *59*, 426-431, <https://doi.org/10.1007/s10086-013-1344-4>.
120. Kunnumakkara, A.B.; Koca, C.; Dey, S.; Gehlot, P.; Yodkeeree, S.; Danda, D.; Sung, B.; Aggarwal, B.B. Traditional uses of spices: an overview. *Molecular targets and therapeutic uses of spices: modern uses for ancient medicine* **2009**, 1-24.

121. Miglani, A.; Manchanda, R.K. Prospective, non-randomised, open-label study of homeopathic *Zingiber officinale* (ginger) in the treatment of *Acne vulgaris*. *Focus on Alternative and Complementary Therapies* **2014**, *19*, 191-197, <https://doi.org/10.1111/ftc.12140>.
122. Penna, S.; Medeiros, M.; Aimbire, F.; Faria-Neto, H.; Sertie, J.; Lopes-Martins, R. Anti-inflammatory effect of the hydralcoholic extract of *Zingiber officinale* rhizomes on rat paw and skin edema. *Phytomedicine* **2003**, *10*, 381-385, <https://doi.org/10.1078/0944-7113-00271>.
123. Indrawati, I.; Miranti, M.; Isy'aini, R.M. Antibacterial activity of ethanolic extracts of rhizome from three ginger varieties against acne isolated bacteria. *Nusantara Bioscience* **2017**, *9*, 92-96, <https://doi.org/10.13057/nusbiosci/n090116>.
124. Mao, Q.-Q.; Xu, X.-Y.; Cao, S.-Y.; Gan, R.-Y.; Corke, H.; Li, H.-B. Bioactive compounds and bioactivities of ginger (*Zingiber officinale* Roscoe). *Foods* **2019**, *8*, <https://doi.org/10.3390/foods8060185>.
125. Satpute, K.; Kalyankar, T. Development and evaluation of herbal cream for the treatment of acne. *Journal of Pharmacognosy and Phytochemistry* **2019**, *8*, 2618-2624.
126. Sadhasivam, S.; Palanivel, S.; Ghosh, S. Synergistic antimicrobial activity of *Boswellia serrata* Roxb. ex Colebr. (Burseraceae) essential oil with various azoles against pathogens associated with skin, scalp and nail infections. *Letters in applied microbiology* **2016**, *63*, 495-501, <https://doi.org/10.1111/lam.12683>.
127. Appiah, S.; Lawley, B.; Vu, M.; Bell, C.; Jones, H. Evaluation of the effectiveness of Eladi Keram for the treatment of *Acne vulgaris*: a randomised controlled pilot study. *European Journal of Integrative Medicine* **2017**, *12*, 38-43, <https://doi.org/10.1016/j.eujim.2017.04.004>.
128. Singh, S.; Khajuria, A.; Taneja, S.; Johri, R.; Singh, J.; Qazi, G. Boswellic acids: A leukotriene inhibitor also effective through topical application in inflammatory disorders. *Phytomedicine* **2008**, *15*, 400-407, <https://doi.org/10.1016/j.phymed.2007.11.019>.
129. Chaudhary, S.S.; Tariq, M.; Zaman, R.; Imtiyaz, S. The In vitro anti-acne activity of two unani drugs. *Ancient science of life* **2013**, *33*, <https://doi.org/10.4103/0257-7941.134594>.
130. Gogoi, R.; Sarma, N.; Loying, R.; Pandey, S.K.; Begum, T.; Lal, M. A Comparative Analysis of Bark and Leaf Essential Oil and their Chemical Composition, Antioxidant, Anti-inflammatory, Antimicrobial Activities and Genotoxicity of North East Indian *Cinnamomum zeylanicum* Blume. *The Natural Products Journal* **2021**, *11*, 74-84, <https://doi.org/10.2174/2210315509666191119111800>.
131. Veerasophon, J.; Sripalakit, P.; Saraphanchotiwitthaya, A. Formulation of anti-acne concealer containing cinnamon oil with antimicrobial activity against *Propionibacterium* acnes. *Journal of advanced pharmaceutical technology & research* **2020**, *11*, https://doi.org/10.4103/japtr.JAPTR_1_20.
132. Wu, G.-X.; Wang, Y.-W.; Wu, C.-S.; Lin, Y.-H.; Hung, C.-H.; Huang, H.-H.; Kuo, S.-M. Therapeutic Efficacy of Sesquiterpene Farnesol in Treatment of *Cutibacterium* acnes-Induced Dermal Disorders. *Molecules* **2021**, *26*, <https://doi.org/10.3390/molecules26185723>.
133. Hou, H.-S.; Bonku, E.M.; Zhai, R.; Zeng, R.; Hou, Y.-L.; Yang, Z.-H.; Quan, C. Extraction of essential oil from *Citrus reticulata* Blanco peel and its antibacterial activity against *Cutibacterium* acnes (formerly *Propionibacterium* acnes). *Heliyon* **2019**, *5*, <https://doi.org/10.1016/j.heliyon.2019.e02947>.
134. Kimura, I.; Yoshikawa, M.; Kobayashi, S.; Sugihara, Y.; Suzuki, M.; Oominami, H.; Murakami, T.; Matsuda, H.; Doiphode, V.V. New triterpenes, myrrhanol A and myrrhanone A, from guggul-gum resins, and their potent anti-inflammatory effect on adjuvant-induced air-pouch granuloma of mice. *Bioorganic & medicinal chemistry letters* **2001**, *11*, 985-989, [https://doi.org/10.1016/S0960-894X\(01\)00111-1](https://doi.org/10.1016/S0960-894X(01)00111-1).
135. Dubey, D.; Prashant, K.; Jain, S. In-vitro antioxidant activity of the ethyl acetate extract of gum guggul (*Commiphora mukul*). In: *Proceedings of the Biological Forum-An Int J.* **2009**; pp. 32-35.
136. Thappa, D.M.; Dogra, J. Nodulocystic acne: oral gugulipid versus tetracycline. *The journal of Dermatology* **1994**, *21*, 729-731, <https://doi.org/10.1111/j.1346-8138.1994.tb03277.x>.
137. Maher, K.; Yassine, B.A.; Sofiane, B. Anti-inflammatory and antioxidant properties of *Eriobotrya japonica* leaves extracts. *African health sciences* **2015**, *15*, 613-620, <https://doi.org/10.4314/ahs.v15i2.39>.
138. Tan, H.; Sonam, T.; Shimizu, K. The potential of triterpenoids from loquat leaves (*Eriobotrya japonica*) for prevention and treatment of skin disorder. *International journal of molecular sciences* **2017**, *18*, <https://doi.org/10.3390/ijms18051030>.
139. Athikomkulchai, S.; Watthanachaiyingcharoen, R.; Tunvichien, S.; Vayumhasuwan, P.; Karnsomkiet, P.; Sae-Jong, P.; Ruangrunsi, N. The development of anti-acne products from *Eucalyptus globulus* and *Psidium guajava* oil. *Journal of Health Research* **2008**, *22*, 109-113.
140. Lee, S.J.; Lee, E.H.; Shin, J.H.; Kim, S.S.; Kim, N.K.; Choi, E.; Seo, S.R. *Eucalyptus globulus* extracts inhibit *Propionibacterium* acnes-induced inflammation signaling. *Korean Journal of Microbiology* **2016**, *52*, 421-427, <https://doi.org/10.7845/kjm.2016.6066>.
141. Bhatt, D.; Sachan, A.; Jain, S. Studies on inhibitory effect of eucalyptus oil on sebaceous glands for the management of Acne. *Indian Journal of Natural Products and Resources* **2011**, *2*, 345-349.
142. Nam, C.; Kim, S.; Sim, Y.; Chang, I. Anti-acne effects of Oriental herb extracts: a novel screening method to select anti-acne agents. *Skin Pharmacology and Physiology* **2003**, *16*, 84-90, <https://doi.org/10.1159/000069030>.
143. Nirmala, P.; Selvaraj, T. Anti-inflammatory and anti-bacterial activities of *Glycyrrhiza glabra* L. *Journal of Agricultural Technology* **2011**, *7*, 815-823.

144. Falcocchio, S.; Ruiz, C.; Pastor, F.J.; Saso, L.; Diaz, P. Propionibacterium acnes GehA lipase, an enzyme involved in acne development, can be successfully inhibited by defined natural substances. *Journal of Molecular Catalysis B: Enzymatic* **2006**, *40*, 132-137, <https://doi.org/10.1016/j.molcatb.2006.02.011>.
145. Pansare, T.; Khandekar, S.; Satpudke, S. Ayurvedic And Modern Aspects of Sariva (Hemidesmus Indicus R. Br): An Overview. *Int J Ayurvedic Herbal Med* **2018**, *8*, 3133-3143.
146. Kumar, G.; Jayaveera, K.; Kumar, C.; Sanjay, U.P.; Swamy, B.; Kumar, D. Antimicrobial effects of Indian medicinal plants against acne-inducing bacteria. *Tropical journal of pharmaceutical research* **2007**, *6*, 717-723, <https://doi.org/10.4314/tjpr.v6i2.14651>.
147. Ravishankara, M.; Shrivastava, N.; Padh, H.; Rajani, M. Evaluation of antioxidant properties of root bark of Hemidesmus indicus R. Br. (Anantmul). *Phytomedicine* **2002**, *9*, 153-160, <https://doi.org/10.1078/0944-7113-00104>.
148. Kumar, G.; Jayaveera, K.; Ashok, C.; Bharathi, T.; Umachigi, S.; Vrushabendra, S. Evaluation of antioxidant and antiacne properties of terpenoidal fraction of Hemidesmus indicus (Indian sarsaparilla). *The Internet Journal of Aesthetic and Antiaging Medicine* **2008**, *1*.
149. Sharifan, A.; Hajhoseini, A.; Bakhtiari, M. Clinical trial and in vitro study investigating topical application of Zataria multiflora Boiss. and Matricaria chamomilla extracts for androgenetic alopecia. *Cogent Medicine* **2017**, *4*, 1421405, <https://doi.org/10.1080/2331205X.2017.1421405>.
150. Al-Hindawi, M.K.; Al-Deen, I.H.; Nabi, M.H.; Ismail, M.A. Anti-inflammatory activity of some Iraqi plants using intact rats. *Journal of ethnopharmacology* **1989**, *26*, 163-168, [https://doi.org/10.1016/0378-8741\(89\)90063-9](https://doi.org/10.1016/0378-8741(89)90063-9).
151. Sharifi-Rad, J.; Salehi, B.; Varoni, E.M.; Sharopov, F.; Yousaf, Z.; Ayatollahi, S.A.; Kobarfard, F.; Sharifi-Rad, M.; Afdjei, M.H.; Sharifi-Rad, M. Plants of the Melaleuca genus as antimicrobial agents: From farm to pharmacy. *Phytotherapy Research* **2017**, *31*, 1475-1494, <https://doi.org/10.1002/ptr.5880>.
152. Bassett, I.B.; Barnetson, R.S.C.; Pannowitz, D.L. A comparative study of tea-tree oil versus benzoylperoxide in the treatment of acne. *Medical Journal of Australia* **1990**, *153*, 455-458, <https://doi.org/10.5694/j.1326-5377.1990.tb126150.x>.
153. Carson, C.; Riley, T. Susceptibility of Propionibacterium acnes to the essential oil of Melaleuca alternifolia. *Letters in Applied Microbiology* **1994**, *19*, 24-25, <https://doi.org/10.1111/j.1472-765X.1994.tb00894.x>.
154. Hart, P.; Brand, C.; Carson, C.; Riley, T.; Prager, R.; Finlay-Jones, J. Terpinen-4-ol, the main component of the essential oil of Melaleuca alternifolia (tea tree oil), suppresses inflammatory mediator production by activated human monocytes. *Inflammation Research* **2000**, *49*, 619-626, <https://doi.org/10.1007/s000110050639>.
155. Kim, H.-J.; Chen, F.; Wu, C.; Wang, X.; Chung, H.Y.; Jin, Z. Evaluation of antioxidant activity of Australian tea tree (Melaleuca alternifolia) oil and its components. *Journal of Agricultural and Food chemistry* **2004**, *52*, 2849-2854, <https://doi.org/10.1021/jf035377d>.
156. Raman, A.; Weir, U.; Bloomfield, S. Antimicrobial effects of tea-tree oil and its major components on Staphylococcus aureus, Staph. epidermidis and Propionibacterium acnes. *Letters in Applied Microbiology* **1995**, *21*, 242-245, <https://doi.org/10.1111/j.1472-765X.1995.tb01051.x>.
157. Hsu, C.; Tsai, T.-H.; Li, Y.-Y.; Wu, W.-H.; Huang, C.-J.; Tsai, P.-J. Wild bitter melon (Momordica charantia Linn. var. abbreviata Ser.) extract and its bioactive components suppress Propionibacterium acnes-induced inflammation. *Food Chemistry* **2012**, *135*, 976-984, <https://doi.org/10.1016/j.foodchem.2012.05.045>.
158. Chuang, L.-T.; Shih, Y.-H.; Huang, W.-C.; Lin, L.-C.; Hsu, C.; Chyuan, J.-H.; Tsai, T.-H.; Tsai, P.-J. In vitro and in vivo screening of wild bitter melon leaf for anti-inflammatory activity against Cutibacterium acnes. *Molecules* **2020**, *25*, <https://doi.org/10.3390/molecules25184277>.
159. Itoh, T.; Tsuchida, A.; Muramatsu, Y.; Ninomiya, M.; Ando, M.; Tsukamasa, Y.; Koketsu, M. Antimicrobial and anti-inflammatory properties of nostocionone isolated from Nostoc commune Vauch and its derivatives against Propionibacterium acnes. *Anaerobe* **2014**, *27*, 56-63, <https://doi.org/10.1016/j.anaerobe.2014.03.006>.
160. Ali, N.; Setzerb, W.N. Pharmacological activities of basil oil a review. *Recent progress in medicinal plants* **2013**, *37*, 286-307.
161. Viyoch, J.; Pisutthanan, N.; Faikreua, A.; Nupangta, K.; Wangtorpol, K.; Ngokkuen, J. Evaluation of in vitro antimicrobial activity of Thai basil oils and their micro-emulsion formulas against Propionibacterium acnes. *International journal of cosmetic science* **2006**, *28*, 125-133, <https://doi.org/10.1111/j.1467-2494.2006.00308.x>.
162. Li, H.; Ge, Y.; Luo, Z.; Zhou, Y.; Zhang, X.; Zhang, J.; Fu, Q. Evaluation of the chemical composition, antioxidant and anti-inflammatory activities of distillate and residue fractions of sweet basil essential oil. *Journal of food science and technology* **2017**, *54*, 1882-1890, <https://doi.org/10.1007/s13197-017-2620-x>.
163. Hapsari, I.P.; Feroniasanti, Y.M.L. Phytochemical screening and in vitro antibacterial activity of sweet basil leaves (Ocimum basilicum L.) essential oil against Cutibacterium acnes ATCC 11827. In: Proceedings of the AIP Conference Proceedings, **2019**; pp. 020007, <https://doi.org/10.1063/1.5098412>.
164. Taleb, M.H.; Abdeltawab, N.F.; Shamma, R.N.; Abdelgayed, S.S.; Mohamed, S.S.; Farag, M.A.; Ramadan, M.A. Origanum vulgare L. essential oil as a potential anti-acne topical nanoemulsion—in vitro and in vivo study. *Molecules* **2018**, *23*, <https://doi.org/10.3390/molecules23092164>.

165. Folle, C.; Marqués, A.M.; Díaz-Garrido, N.; Espina, M.; Sánchez-López, E.; Badia, J.; Baldoma, L.; Calpena, A.C.; García, M.L. Thymol-loaded PLGA nanoparticles: an efficient approach for acne treatment. *Journal of nanobiotechnology* **2021**, *19*, 1-21, <https://doi.org/10.1186/s12951-021-01092-z>.
166. Kumar, R.; Gupta, Y.K.; Singh, S.; Raj, A. Anti-inflammatory effect of Picrorhiza kurroa in experimental models of inflammation. *Planta medica* **2016**, *82*, 1403-1409, <https://doi.org/10.1055/s-0042-106304>.
167. Rajkumar, V.; Guha, G.; Kumar, R.A. Antioxidant and anti-neoplastic activities of Picrorhiza kurroa extracts. *Food and Chemical Toxicology* **2011**, *49*, 363-369, <https://doi.org/10.1016/j.fct.2010.11.009>.
168. Sharma, N. Picrorhiza kurroa. In: *Himalayan Medicinal Plants*. Elsevier: **2021**; pp. 67-83.
169. Sultan, M.Z.; Jeon, Y.-M.; Moon, S.-S. Labdane-type diterpenes active against acne from pine cones (*Pinus densiflora*). *Planta medica* **2008**, *74*, 449-452, <https://doi.org/10.1055/s-2008-1034321>.
170. Smith, E.C.; Wareham, N.; Zloh, M.; Gibbons, S. 2 β -Acetoxyferruginol—a new antibacterial abietane diterpene from the bark of *Prumnopitys andina*. *Phytochemistry Letters* **2008**, *1*, 49-53, <https://doi.org/10.1016/j.phytol.2007.12.006>.
171. Lee, E.-J.; Bae, S.-Y.; NamKung, W.; Lee, Y.-H. Antibacterial and anti-inflammatory effects of medicinal plants against acne-inducing bacteria. *Journal of the Society of Cosmetic Scientists of Korea* **2010**, *36*, 57-63.
172. Chen, C.-H.; Hwang, T.-L.; Chen, L.-C.; Chang, T.-H.; Wei, C.-S.; Chen, J.-J. Isoflavones and anti-inflammatory constituents from the fruits of *Psoralea corylifolia*. *Phytochemistry* **2017**, *143*, 186-193, <https://doi.org/10.1016/j.phytochem.2017.08.004>.
173. Jiangning, G.; Xinchu, W.; Hou, W.; Qinghua, L.; Kaishun, B. Antioxidants from a Chinese medicinal herb—*Psoralea corylifolia* L. *Food chemistry* **2005**, *91*, 287-292, <https://doi.org/10.1016/j.foodchem.2004.04.029>.
174. Kubo, I.; Xu, Y.; Shimizu, K. Antibacterial activity of ent-kaurene diterpenoids from *Rabdosia rosthornii*. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives* **2004**, *18*, 180-183, <https://doi.org/10.1002/ptr.1421>.
175. Wedler, J.; Weston, A.; Rausenberger, J.; Butterweck, V. In vitro modulation of inflammatory target gene expression by a polyphenol-enriched fraction of rose oil distillation waste water. *Fitoterapia* **2016**, *114*, 56-62, <https://doi.org/10.1016/j.fitote.2016.08.019>.
176. Mileva, M.; Krumova, E.; Miteva-Staleva, J.; Kostadinova, N.; Dobрева, A.; Galabov, A.S. Chemical compounds, in vitro antioxidant and antifungal activities of some plant essential oils belonging to Rosaceae family. *Compt. Rend. Acad. Bulg. Sci* **2014**, *67*, 1363-1368.
177. Akram, M.; Riaz, M.; Munir, N.; Akhter, N.; Zafar, S.; Jabeen, F.; Ali Shariati, M.; Akhtar, N.; Riaz, Z.; Altaf, S.H. Chemical constituents, experimental and clinical pharmacology of *Rosa damascena*: a literature review. *Journal of Pharmacy and Pharmacology* **2020**, *72*, 161-174, <https://doi.org/10.1111/jphp.13185>.
178. Yun, H.-J.; Heo, S.-K.; Yun, H.-J.; Park, W.-H.; Park, S.-D. Anti-inflammatory effect of *Salviae miltiorrhizae Radix*. *The Korea Journal of Herbology* **2007**, *22*, 65-73.
179. Kim, S.-H.; Kim, I.-C. Antioxidative Properties and Whitening Effects of the *Eucommiae cortex*, *Salviae miltiorrhizae radix*, *Aurantii nobilis pericarpium* and *Cnidii rhizoma*. *Journal of the East Asian Society of Dietary Life* **2008**, *18*, 618-623.
180. Kang, N.-G.; Park, J.-E.; Song, Y.-S.; Kim, J.-A.; Park, M.-E.; Lee, Y.-H.; Cho, W.-G.; Kang, S.-H. Cryptotanshinone for treating *Acne vulgaris*. *Journal of the Society of Cosmetic Scientists of Korea* **2002**, *28*, 99-115.
181. Wei, M.-P.; Qiu, J.-D.; Li, L.; Xie, Y.-F.; Yu, H.; Guo, Y.-H.; Yao, W.-R. Saponin fraction from *Sapindus mukorossi Gaertn* as a novel cosmetic additive: Extraction, biological evaluation, analysis of anti-acne mechanism and toxicity prediction. *Journal of Ethnopharmacology* **2021**, *268*, <https://doi.org/10.1016/j.jep.2020.113552>.
182. Wei, M.-P.; Yu, H.; Guo, Y.-H.; Cheng, Y.-L.; Xie, Y.-F.; Yao, W.-R. Potent in vitro synergistic antibacterial activity of natural amphiphilic Sapindoside A and B against *Cutibacterium acnes* with destructive effect on bacterial membrane. *Biochimica et Biophysica Acta (BBA)-Biomembranes* **2021**, *1863*, <https://doi.org/10.1016/j.bbamem.2021.183699>.
183. Kwon, H.H.; Yoon, J.Y.; Park, S.Y.; Min, S.; Kim, Y.-i.; Park, J.Y.; Lee, Y.-S.; Thiboutot, D.M.; Suh, D.H. Activity-guided purification identifies lupeol, a pentacyclic triterpene, as a therapeutic agent multiple pathogenic factors of acne. *Journal of Investigative Dermatology* **2015**, *135*, 1491-1500, <https://doi.org/10.1038/jid.2015.29>.
184. Choi, S.-M.; Kim, M.-J.; Choi, Y.-H.; Ahn, H.-J.; Yun, Y.-P. Screening of the antibacterial activity of natural products against *Propionibacterium acnes*. *Yakhak Hoeji* **1998**, *42*, 89-94.
185. Choi, S.-M.; Kim, C.-D.; Lee, M.-H.; Choi, Y.-H.; Rang, M.-J.; Ahn, H.-J.; Yun, Y.-P.; Screening of 5 α -Reductase Inhibition and Comedolytic Effects from Natural Products. *Yakhak Hoeji* **1999**, *43*, 342-350.
186. Tsai, T.-H.; Huang, W.-C.; Lien, T.-J.; Huang, Y.-H.; Chang, H.; Yu, C.-H.; Tsai, P.-J. Clove extract and eugenol suppress inflammatory responses elicited by *Propionibacterium acnes* in vitro and in vivo. *Food and Agricultural Immunology* **2017**, *28*, 916-931, <https://doi.org/10.1080/09540105.2017.1320357>.
187. Sharma, R.; Kishore, N.; Hussein, A.; Lall, N. Antibacterial and anti-inflammatory effects of *Syzygium jambos* L.(Alston) and isolated compounds on *Acne vulgaris*. *BMC complementary and alternative medicine* **2013**, *13*, 1-10, <https://doi.org/10.1186/1472-6882-13-292>.

- 188.Sawant, R.; Zinjurke, B. Evaluation On Efficacy Of Dashanga Lepa (With Sandalwood) & Dashanga Lepa (With Red Sandalwood) On Patients Of Mukhadushika With Special Reference To *Acne Vulgaris*. *Global Journal of Research on Medicinal Plants & Indigenous Medicine* **2015**, *4*, <http://dx.doi.org/10.21088/ijamy.0974.6986.8315.1>.
- 189.Narkhede, M.B.; Wagh, A.E.; Rathi, A.M. Anti-inflammatory activity of *Vetiveria zizanioides* (Linn.) root. *Journal of Pharmacy Research* **2012**, *5*, 2016-2017.
- 190.Luqman, S.; Kumar, R.; Kaushik, S.; Srivastava, S.; Darokar, M.P.; Khanuja, S.P. Antioxidant potential of the root of *Vetiveria zizanioides* (L.) Nash. *Indian journal of biochemistry & biophysics* **2009**, *46*, 122-125.
- 191.David, A.; Wang, F.; Sun, X.; Li, H.; Lin, J.; Li, P.; Deng, G. Chemical composition, antioxidant, and antimicrobial activities of *Vetiveria zizanioides* (L.) nash essential oil extracted by carbon dioxide expanded ethanol. *Molecules* **2019**, *24*, <https://doi.org/10.3390/molecules24101897>.
- 192.van Staden, A.B.; De Canha, M.; Nqephe, M.; Rademan, S.; Kumar, V.; Lall, N. Potential medicinal plants for progressive macular hypomelanosis. *South African Journal of Botany* **2017**, *111*, 346-357, <https://doi.org/10.1016/j.sajb.2017.04.007>.
- 193.Giri, K.R. Comparative study of anti-inflammatory activity of *Withania somnifera* (Ashwagandha) with hydrocortisone in experimental animals (Albino rats). *J Med Plants Studies* **2016**, *4*, 78-83.
- 194.Bhattacharya, S.K.; Satyan, K.S.; Ghosal, S. Antioxidant activity of glycowithanolides from *Withania somnifera*. *Indian journal of experimental biology* **1997**, *35*, 236-239.
- 195.Seki, T.; Morohashi, M. Effect of some alkaloids, flavonoids and triterpenoids, contents of Japanese-Chinese traditional herbal medicines, on the lipogenesis of sebaceous glands. *Skin Pharmacology and Physiology* **1993**, *6*, 56-60, <https://doi.org/10.1159/000211087>.
- 196.Shah, R.; Peethambaran, B. Anti-inflammatory and Anti-microbial Properties of *Achillea millefolium* in Acne Treatment. In: *Immunity and inflammation in health and disease*. Elsevier: **2018**; pp. 241-248, <https://doi.org/10.1016/B978-0-12-805417-8.00019-6>.
- 197.Gilca, M.; Tiplica, G.S.; Salavastru, C.M. Traditional and ethnobotanical dermatology practices in Romania and other Eastern European countries. *Clinics in dermatology* **2018**, *36*, 338-352, <https://doi.org/10.1016/j.clindermatol.2018.03.008>.
- 198.Lee, J.W.; Kang, Y.J.; Choi, H.K.; Yoon, Y.G. Fractionated *Coptis chinensis* extract and its bioactive component suppress *Propionibacterium acnes*-stimulated inflammation in human keratinocytes. *Journal of microbiology and biotechnology* **2018**, *28*, 839-848, <https://doi.org/10.4014/jmb.1712.12051>.
- 199.Kim, E.-H.; Jang, Y.-A.; Kim, S.-B.; Kim, H.-H.; Lee, J.-T. Antimicrobial, antifungal effect and safety verification using BCOP assay of extracts from *Coptis chinensis*. *Journal of Applied Biological Chemistry* **2018**, *61*, 297-304, <https://doi.org/10.3839/jabc.2018.042>.
- 200.Schinella, G.; Tournier, H.; Prieto, J.; De Buschiazzo, P.M.; Rios, J. Antioxidant activity of anti-inflammatory plant extracts. *Life sciences* **2002**, *70*, 1023-1033, [https://doi.org/10.1016/S0024-3205\(01\)01482-5](https://doi.org/10.1016/S0024-3205(01)01482-5).
- 201.Clement-Kruzel, S.; Hwang, S.-A.; Kruzel, M.C.; Dasgupta, A.; Actor, J.K. Immune modulation of macrophage pro-inflammatory response by goldenseal and *Astragalus* extracts. *Journal of medicinal food* **2008**, *11*, 493-498, <https://doi.org/10.1089/jmf.2008.0044>.
- 202.Silva, A.P.d.; Rocha, R.; Silva, C.M.; Mira, L.; Duarte, M.F.; Florêncio, M.H. Antioxidants in medicinal plant extracts. A research study of the antioxidant capacity of *Crataegus*, *Hamamelis* and *Hydrastis*. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives* **2000**, *14*, 612-616, [https://doi.org/10.1002/1099-1573\(200012\)14:8%3C612::AID-PTR677%3E3.0.CO;2-T](https://doi.org/10.1002/1099-1573(200012)14:8%3C612::AID-PTR677%3E3.0.CO;2-T).
- 203.Scazzocchio, F.; Cometa, M.; Tomassini, L.; Palmery, M. Antibacterial activity of *Hydrastis canadensis* extract and its major isolated alkaloids. *Planta medica* **2001**, *67*, 561-564, <https://doi.org/10.1055/s-2001-16493>.
- 204.Slobodníková, L.; Košťálová, D.; Labudová, D.; Kotulová, D.; Kettmann, V. Antimicrobial activity of *Mahonia aquifolium* crude extract and its major isolated alkaloids. *Phytotherapy Research* **2004**, *18*, 674-676, <https://doi.org/10.1002/ptr.1517>.
- 205.Rackova, L.; Oblozinsky, M.; Kostalova, D.; Kettmann, V.; Bezakova, L. Free radical scavenging activity and lipoxygenase inhibition of *Mahonia aquifolium* extract and isoquinoline alkaloids. *Journal of inflammation* **2007**, *4*, 1-7, <https://doi.org/10.1186/1476-9255-4-15>.
- 206.Hajnická, V.; Košťálová, D.; Švecová, D.; Sochorová, R.; Fuchsberger, N.; Tóth, J. Effect of *Mahonia aquifolium* active compounds on interleukin-8 production in the human monocytic cell line THP-1. *Planta medica* **2002**, *68*, 266-268, <https://doi.org/10.1055/s-2002-23126>.
- 207.Letawe, C.; Boone, M.; Pierard, G. Digital image analysis of the effect of topically applied linoleic acid on acne microcomedones. *Clinical and experimental Dermatology* **1998**, *23*, 56-58, <https://doi.org/10.1046/j.1365-2230.1998.00315.x>.
- 208.Kim, Y.-G.; Lee, J.-H.; Lee, J. Antibiofilm activities of fatty acids including myristoleic acid against *Cutibacterium acnes* via reduced cell hydrophobicity. *Phytomedicine* **2021**, *91*, <https://doi.org/10.1016/j.phymed.2021.153710>.

209. Manju, V.; Revathi, R.; Murugesan, M. In vitro Antioxidant, Antimicrobial, Anti-inflammatory, Anthelmintic Activity and Phytochemical Analysis of Indian Medicinal Spices. *Research Journal of Pharmacy and Technology* **2011**, *4*, 596-599.
210. Krist, S.; Stuebiger, G.; Unterweger, H.; Bandion, F.; Buchbauer, G. Analysis of volatile compounds and triglycerides of seed oils extracted from different poppy varieties (*Papaver somniferum* L.). *Journal of agricultural and food chemistry* **2005**, *53*, 8310-8316, <https://doi.org/10.1021/jf0580869>.
211. Sultan, M.Z.; Lee, K.-M.; Moon, S.-S. Antibacterial effect of naturally occurring unsaturated fatty acids from *Prunus japonica* against *Propionibacterium acnes*. *Oriental Pharmacy and Experimental Medicine* **2009**, *9*, 90-96, <https://doi.org/10.3742/OPEM.2009.9.1.090>.
212. Rahat, I.; Sharma, S.K. A Novel Antibacterial Topical Gel from *Nigella sativa* and *Achyranthes aspera* against Acne Causing Microorganisms. *Journal of Pharmaceutical Research International* **2020**, *57-63*, <https://doi.org/10.9734/jpri/2020/v32i4131043>.
213. Thafshila, A.A.M.; Anuradha, R. Evaluation Of In Vitro Antioxidant Properties Of Ethanolic And Aqueous Extracts Of *Achyranthes Aspera* L. *World Journal of Pharmaceutical research* **2018**, *7*, 1628-1639.
214. Mastan, A. Effectiveness of treatment of *Acne vulgaris* (Busūr labaniyya): A comparative review between modern and unani medicine. *Int J Unani Integ Med* **2020**, *4*, 1-4. <https://doi.org/10.33545/2616454X.2020.v4.i3a.135>.
215. Ghimire, K.; Banerjee, J.; Gupta, A.K.; Dahal, P. Phytochemical constituents and pharmacological uses of medicinal plant *Achyranthes aspera*: A Review. *World journal of pharmaceutical research* **2015**, *4*, 470-489.
216. Zhoh, C.; Kwon, H.; Ahn, S. Antioxidative and Antimicrobial Effects to Skin Flora of Extracts from Peel of *Allium cepa* L. *Asian Journal of Beauty and Cosmetology* **2010**, *8*, 49-58.
217. Orășan, O.; Oprean, R.; Saplonțai-Pop, A.; Filip, M.; Carpa, R.; Saroși, C.; Moldovan, M.; Man, S. Antimicrobial activity and thiosulfinate profile of a formulation based on *Allium cepa* L. extract. *Open Chemistry* **2017**, *15*, 175-181, <https://doi.org/10.1515/chem-2017-0021>.
218. Matsuda, H.; Sato, N.; Yamazaki, M.; Naruto, S.; Kubo, M. Testosterone 5 α -reductase inhibitory active constituents from *Anemarrhenae Rhizoma*. *Biological and Pharmaceutical Bulletin* **2001**, *24*, 586-587, <https://doi.org/10.1248/bpb.24.586>.
219. Kim, J.-Y.; Shin, J.-S.; Ryu, J.H.; Kim, S.Y.; Cho, Y.-W.; Choi, J.-H.; Lee, K.-T. Anti-inflammatory effect of anemarsaponin B isolated from the rhizomes of *Anemarrhena asphodeloides* in LPS-induced RAW 264.7 macrophages is mediated by negative regulation of the nuclear factor- κ B and p38 pathways. *Food and chemical toxicology* **2009**, *47*, 1610-1617, <https://doi.org/10.1016/j.fct.2009.04.009>.
220. Kwon, O.J.; Lee, H.Y.; Kim, T.H.; Kim, S.G. Antioxidant and pancreatic lipase inhibitory activities of *Anemarrhena asphodeloides*. *Korean Journal of Food Preservation* **2014**, *21*, 421-426, <https://doi.org/10.11002/kjfp.2014.21.3.421>.
221. Wang, Z.; Cai, J.; Fu, Q.; Cheng, L.; Wu, L.; Zhang, W.; Zhang, Y.; Jin, Y.; Zhang, C. Anti-inflammatory activities of compounds isolated from the rhizome of *Anemarrhena asphodeloides*. *Molecules* **2018**, *23*, <https://doi.org/10.3390/molecules23102631>.
222. Rasheed, A.; Shama, S.N.; Joy, J.M.; Reddy, B.S.; Roja, C. Formulation and evaluation of herbal anti-acne moisturizer. *Pakistan journal of pharmaceutical sciences* **2012**, *25*.
223. Jantarat, C.; Sirathanarun, P.; Chuchue, T.; Konpian, A.; Sukkua, G.; Wongprasert, P. In vitro antimicrobial activity of gel containing the herbal ball extract against *propionibacterium acnes*. *Scientia pharmaceutica* **2018**, *86*, <https://doi.org/10.3390/scipharm86010008>.
224. Sheeja, K.; Shihab, P.; Kuttan, G. Antioxidant and anti-inflammatory activities of the plant *Andrographis paniculata* Nees. *Immunopharmacology and immunotoxicology* **2006**, *28*, 129-140, <https://doi.org/10.1080/08923970600626007>.
225. Arifullah, M.; Namsa, N.D.; Mandal, M.; Chiruvella, K.K.; Vikrama, P.; Gopal, G.R. Evaluation of anti-bacterial and anti-oxidant potential of andrographolide and echiodinin isolated from callus culture of *Andrographis paniculata* Nees. *Asian Pacific journal of tropical biomedicine* **2013**, *3*, 604-610, [https://doi.org/10.1016/S2221-1691\(13\)60123-9](https://doi.org/10.1016/S2221-1691(13)60123-9).
226. Fu, S.; Sun, C.; Tao, X.; Ren, Y. Anti-inflammatory effects of active constituents extracted from Chinese medicinal herbs against *Propionibacterium acnes*. *Natural product research* **2012**, *26*, 1746-1749, <https://doi.org/10.1080/14786419.2011.608675>.
227. Pasalar, M.; Tabatabaei, F.; Bradley, R.; Tajadini, H.; Kamali, M.; Hasheminasab, F.S.; Parvizi, M.M. Mechanistic support of traditional Persian medicine for the treatment of *Acne vulgaris*: A scoping review. *Journal of Cosmetic Dermatology* **2021**, <https://doi.org/10.1111/jocd.14464>.
228. Abiya, S.; Odiyi, B.; Falarunu, L.; Abiya, N. Antimicrobial activity of three medicinal plants against acne-inducing bacteria *Propionibacterium acnes*. *Brazilian Journal of Biological Sciences* **2018**, *5*, 277-288, <https://doi.org/10.21472/bjbs.051008>.
229. Alnabati, N.A.; Al-Hejin, A.M.; Noor, S.O.; Ahmed, M.M.M.; Abu-Zeid, M.; Mleeh, N.T. The antibacterial activity of four Saudi medicinal plants against clinical isolates of *Propionibacterium acnes*. *Biotechnology & Biotechnological Equipment* **2021**, *35*, 415-424, <https://doi.org/10.1080/13102818.2021.1885992>.

230. Alzohairy, M.A. Therapeutics role of *Azadirachta indica* (Neem) and their active constituents in diseases prevention and treatment. *Evidence-Based Complementary and Alternative Medicine* **2016**, 2016, <https://doi.org/10.1155/2016/7382506>.
231. Yogesh, H.R.; Gajjar, T.; Patel, N.; Kumawat, R. Clinical study to assess efficacy and safety of Purifying Neem Face Wash in prevention and reduction of acne in healthy adults. *Journal of cosmetic dermatology* **2021**, <https://doi.org/10.1111/jocd.14486>.
232. Rusko, G. Screening research of 90% aqueous ethanolic plant extracts antimicrobial activity against *Propionibacterium acnes* — an etiological factor of acne occurrence. *Reports of Vinnytsia National Medical University* **2020**, *24*, 75-79. [https://doi.org/10.31393/reports-vnmedical-2020-24\(1\)-14](https://doi.org/10.31393/reports-vnmedical-2020-24(1)-14)
233. Silva, D.; Ferreira, M.S.; Sousa-Lobo, J.M.; Cruz, M.T.; Almeida, I.F. Anti-Inflammatory Activity of *Calendula officinalis* L. Flower Extract. *Cosmetics* **2021**, *8*, <https://doi.org/10.3390/cosmetics8020031>.
234. Preethi, K.; Kuttan, G.; Kuttan, R. Antioxidant Potential of an Extract of *Calendula officinalis*. Flowers in Vitro. and in Vivo. *Pharmaceutical Biology* **2006**, *44*, 691-697, <https://doi.org/10.1080/13880200601009149>.
235. Muley, B.; Khadabadi, S.; Banarase, N. Phytochemical constituents and pharmacological activities of *Calendula officinalis* Linn (Asteraceae): a review. *Tropical journal of pharmaceutical research* **2009**, *8*, <https://doi.org/10.4314/tjpr.v8i5.48090>.
236. Jaturapisanukul, K.; Udompataikul, M.; Kanokrungrsee, S.; Rojhirunsakool, S.; Kamanamool, N.; Rachpirom, M.; Puttarak, P. Efficacy and safety of a novel water-soluble herbal patch for *Acne vulgaris* treatment: A randomized, assessor-blinded controlled, intra-individual split-face comparative study. *Dermatologic Therapy* **2021**, *34*, <https://doi.org/10.1111/dth.14925>.
237. Pukumpuang, W.; Thongwai, N.; Tragoolpua, Y. Total phenolic contents, antibacterial and antioxidant activities of some Thai medicinal plant extracts. *Journal of Medicinal Plants Research* **2012**, *6*, 4953-4960..
238. Saranga, R. Efficacy of Lakshadi Lepa on controlling mild acne. *University of Kelaniya Sri Lanka* **2017**.
239. Fatmawati, S.; Purnomo, A.S.; Bakar, M.F.A. Chemical constituents, usage and pharmacological activity of *Cassia alata*. *Heliyon* **2020**, *6*, <https://doi.org/10.1016/j.heliyon.2020.e04396>.
240. Liu, C.; Chen, J.; Li, E.; Fan, Q.; Wang, D.; Li, P.; Li, X.; Chen, X.; Qiu, S.; Gao, Z. The comparison of antioxidative and hepatoprotective activities of *Codonopsis pilosula* polysaccharide (CP) and sulfated CP. *International immunopharmacology* **2015**, *24*, 299-305, <https://doi.org/10.1016/j.intimp.2014.12.023>.
241. Meng, Y.; Xu, Y.; Chang, C.; Qiu, Z.; Hu, J.; Wu, Y.; Zhang, B.; Zheng, G. Extraction, characterization and anti-inflammatory activities of an inulin-type fructan from *Codonopsis pilosula*. *International Journal of Biological Macromolecules* **2020**, *163*, 1677-1686, <https://doi.org/10.1016/j.ijbiomac.2020.09.117>.
242. He, J.-Y.; Ma, N.; Zhu, S.; Komatsu, K.; Li, Z.-Y.; Fu, W.-M. The genus *Codonopsis* (Campanulaceae): a review of phytochemistry, bioactivity and quality control. *Journal of natural medicines* **2015**, *69*, 1-21, <https://doi.org/10.1007/s11418-014-0861-9>.
243. Rocha, F.G.; de Mello Brandenburg, M.; Pawloski, P.L.; da Silva Soley, B.; Costa, S.C.A.; Meinerz, C.C.; Baretta, I.P.; Otuki, M.F.; Cabrini, D.A. Preclinical study of the topical anti-inflammatory activity of *Cyperus rotundus* L. extract (Cyperaceae) in models of skin inflammation. *Journal of ethnopharmacology* **2020**, *254*, <https://doi.org/10.1016/j.jep.2020.112709>.
244. Yazdanparast, R.; Ardestani, A. In vitro antioxidant and free radical scavenging activity of *Cyperus rotundus*. *Journal of Medicinal Food* **2007**, *10*, 667-674, <https://doi.org/10.1089/jmf.2006.090>.
245. Peerzada, A.M.; Ali, H.H.; Naeem, M.; Latif, M.; Bukhari, A.H.; Tanveer, A. *Cyperus rotundus* L.: Traditional uses, phytochemistry, and pharmacological activities. *Journal of ethnopharmacology* **2015**, *174*, 540-560, <https://doi.org/10.1016/j.jep.2015.08.012>.
246. Ko, M.-O.; Kang, H.-J.; Hwang, J.-H.; Yang, K.-W. Screening of the antibacterial effects by ethanol extracts from natural plant in Jeju against *Propionibacterium acnes*. *Journal of the Society of Cosmetic Scientists of Korea* **2018**, *44*, 59-66, <https://doi.org/10.15230/SCSK.2018.44.1.59>.
247. Ng, T.; Liu, F.; Wang, H. The antioxidant effects of aqueous and organic extracts of *Panax quinquefolium*, *Panax notoginseng*, *Codonopsis pilosula*, *Pseudostellaria heterophylla* and *Glehnia littoralis*. *Journal of ethnopharmacology* **2004**, *93*, 285-288, <https://doi.org/10.1016/j.jep.2004.03.040>.
248. Yoon, T.; Lee, D.Y.; Lee, A.Y.; Choi, G.; Choo, B.K.; Kim, H.K. Anti-inflammatory effects of *Glehnia littoralis* extract in acute and chronic cutaneous inflammation. *Immunopharmacology and immunotoxicology* **2010**, *32*, 663-670, <https://doi.org/10.3109/08923971003671108>.
249. Feng, Z.-J.; Zhang, X.-H.; Zhang, J.-P.; Shang, X.-H.; Gao, Y.; Lu, X.-L.; Liu, X.-Y.; Jiao, B.-H. A new aromatic glycoside from *Glehnia littoralis*. *Natural product research* **2014**, *28*, 551-554, <https://doi.org/10.1080/14786419.2014.886206>.
250. Yamaguchi, N.; Satoh-Yamaguchi, K.; Ono, M. In vitro evaluation of antibacterial, anticollagenase, and antioxidant activities of hop components (*Humulus lupulus*) addressing *Acne vulgaris*. *Phytomedicine* **2009**, *16*, 369-376, <https://doi.org/10.1016/j.phymed.2008.12.021>.
251. Lim, Y.-H.; Kim, I.-H.; Seo, J.-J. In vitro activity of kaempferol isolated from the *Impatiens balsamina* alone and in combination with erythromycin or clindamycin against *Propionibacterium acnes*. *Journal of microbiology* **2007**, *45*, 473-477.

252. Sakunphueak, A.; Panichayupakaranant, P. Comparison of antimicrobial activities of naphthoquinones from *Impatiens balsamina*. *Natural Product Research* **2012**, *26*, 1119-1124, <https://doi.org/10.1080/14786419.2010.551297>.
253. Kılıç, S.; Okullu, S.Ö.; Kurt, Ö.; Sevinç, H.; Dündar, C.; Altınordu, F.; Türkoğlu, M. Efficacy of two plant extracts against *Acne vulgaris*: initial results of microbiological tests and cell culture studies. *Journal of cosmetic dermatology* **2019**, *18*, 1061-1065, <https://doi.org/10.1111/jocd.12814>.
254. Carvalho, M.; Ferreira, P.J.; Mendes, V.S.; Silva, R.; Pereira, J.A.; Jerónimo, C.; Silva, B.M. Human cancer cell antiproliferative and antioxidant activities of *Juglans regia* L. *Food and chemical toxicology* **2010**, *48*, 441-447, <https://doi.org/10.1016/j.fct.2009.10.043>.
255. Jahanban-Esfahlan, A.; Ostadrahimi, A.; Tabibiazar, M.; Amarowicz, R. A comprehensive review on the chemical constituents and functional uses of walnut (*Juglans* spp.) husk. *International journal of molecular sciences* **2019**, *20*, 3920, <https://doi.org/10.3390/ijms20163920>.
256. Xian, Y.-F.; Mao, Q.-Q.; Ip, S.-P.; Lin, Z.-X.; Che, C.-T. Comparison on the anti-inflammatory effect of Cortex Phellodendri Chinensis and Cortex Phellodendri Amurensis in 12-O-tetradecanoyl-phorbol-13-acetate-induced ear edema in mice. *Journal of Ethnopharmacology* **2011**, *137*, 1425-1430, <https://doi.org/10.1016/j.jep.2011.08.014>.
257. Chen, M.-L.; Xian, Y.-F.; Ip, S.-P.; Tsai, S.-H.; Yang, J.-Y.; Che, C.-T. Chemical and biological differentiation of Cortex Phellodendri Chinensis and Cortex Phellodendri amurensis. *Planta medica* **2010**, *76*, 1530-1535, <https://doi.org/10.1055/s-0030-1249774>.
258. Sun, Y.; Lenon, G.B.; Yang, A.W.H. Phellodendri cortex: a phytochemical, pharmacological, and pharmacokinetic review. *Evidence-Based Complementary and Alternative Medicine* **2019**, *2019*, <https://doi.org/10.1155/2019/7621929>.
259. Kuo, C.-W.; Chiu, Y.-F.; Wu, M.-H.; Li, M.-H.; Wu, C.-N.; Chen, W.-S.; Huang, C.-H. Gelatin/Chitosan Bilayer Patches Loaded with Cortex Phellodendron amurense/Centella asiatica Extracts for Anti-Acne Application. *Polymers* **2021**, *13*, <https://doi.org/10.3390/polym13040579>.
260. Rasheed, A.; Avinash Kumar Reddy, G.; Mohanalakshmi, S.; Ashok Kumar, C. Formulation and comparative evaluation of poly herbal anti-acne face wash gels. *Pharmaceutical biology* **2011**, *49*, 771-774, <https://doi.org/10.3109/13880209.2010.547207>.
261. Bunkar, A.R. Therapeutic uses of *Rauwolfia serpentina*. *Int J Adv Sci Res* **2017**, *2*, 23-26.
262. Saising, J.; Voravuthikunchai, S.P. Anti Propionibacterium acnes activity of rhodomyrton, an effective compound from *Rhodomyrtus tomentosa* (Aiton) Hassk. leaves. *Anaerobe* **2012**, *18*, 400-404, <https://doi.org/10.1016/j.anaerobe.2012.05.003>.
263. Wunnoo, S.; Billman, S.; Amnuakit, T.; Ontong, J.C.; Singh, S.; Auepemkiate, S.; Voravuthikunchai, S.P. Rhodomyrton as a New Natural Antibiotic Isolated from *Rhodomyrtus tomentosa* Leaf Extract: A Clinical Application in the Management of *Acne Vulgaris*. *Antibiotics* **2021**, *10*, 108, <https://doi.org/10.3390/antibiotics10020108>.
264. Gurunani, S.G.; Karadi, R.V. Evaluation of traditionally claimed *Salmalia malabarica* (DC) Schot & Endlicher for anti-acne activity: An in-vitro and in-vivo approach. *Journal of Pharmacognosy and Phytochemistry* **2018**, *7*, 2032-2037.
265. Jain, V.; Verma, S.K. *Pharmacology of Bombax ceiba* Linn. Springer Science & Business Media: **2012**.
266. Gopal, H.; Gupta, R. Chemical constituents of *Salmalia malabarica* Schott and Endl. flowers. *Journal of pharmaceutical sciences* **1972**, *61*, 807-808, <https://doi.org/10.1002/jps.2600610534>.
267. Kamei, Y.; Sueyoshi, M.; Hayashi, K.-i.; Terada, R.; Nozaki, H. The novel anti-Propionibacterium acnes compound, Sargafuran, found in the marine brown alga *Sargassum macrocarpum*. *The Journal of antibiotics* **2009**, *62*, 259-263, <https://doi.org/10.1038/ja.2009.25>.
268. Park, S.-Y.; Kim, J.-H.; Choi, J.-H. Anti-microbial Activity of Various Herbal Extracts on Six Types of Bacteria Related to Skin Diseases and Effects of *Saussurea lappa* Extract on Inflammatory Mechanism. *The Journal of Korean Medicine Ophthalmology and Otolaryngology and Dermatology* **2004**, *17*, 104-125.
269. Chang, K.-M.; Choi, S.-I.; Kim, G.-H. Anti-oxidant activity of *Saussurea lappa* CB Clarke roots. *Preventive nutrition and food science* **2012**, *17*, 306, <https://dx.doi.org/10.3746%2Fpnf.2012.17.4.306>.
270. Madhuri, K.; Elango, K.; Ponnusankar, S. *Saussurea lappa* (Kuth root): review of its traditional uses, phytochemistry and pharmacology. *Oriental pharmacy and Experimental medicine* **2012**, *12*, 1-9, <https://doi.org/10.1007/s13596-011-0043-1>.
271. Sawaya, M.E. Novel agents for the treatment of alopecia. In: *Proceedings of the Seminars in Cutaneous Medicine and Surgery*. 1998; pp. 276-283.
272. Beltrami, B.; Vassallo, C.; Berardesca, E.; Borroni, G. Anti-inflammatory, antimicrobial, comedolytic effects of a topical plant complex treatment in *Acne vulgaris*: a clinical trial. *Journal of applied cosmetology* **2001**, *19*, 11-20.
273. Marti, G.; Joulia, P.; Amiel, A.; Fabre, B.; David, B.; Fabre, N.; Fiorini-Puybaret, C. Comparison of the phytochemical composition of *Serenoa repens* extracts by a multiplexed metabolomic approach. *Molecules* **2019**, *24*, <https://doi.org/10.3390/molecules24122208>.
274. Lal, B.; Singh, K. Indigenous herbal remedies used to cure skin disorders by the natives of Lahaul-Spiti in Himachal Pradesh. *NIScPR Online Periodicals Repository* **2008**.

275. Koh, Y.-J.; Cha, D.-S.; Ko, J.-S.; Park, H.-J.; Choi, H.-D. Anti-inflammatory effect of *Taraxacum officinale* leaves on lipopolysaccharide-induced inflammatory responses in RAW 264.7 cells. *Journal of medicinal food* **2010**, *13*, 870-878, <https://doi.org/10.1089/jmf.2009.1249>.
276. Srividya, A.; Balai, P.; Raghu, H.; Vijayan, P. Antioxidant and antiadipogenic activity of *Taraxacum officinale* in vitro screening methods. *The Pharmacist* **2008**, *3*, 41-44.
277. Kim, H.; Chan, G. Antimicrobial Effects of Extracts of *Taraxacum officinale* H. on *Acnes* Strains. *International Journal of Complementary and Alternative Medicine* **2011**, *7*, 3-16.
278. Choi, J.; Yoon, K.D.; Kim, J. Chemical constituents from *Taraxacum officinale* and their α -glucosidase inhibitory activities. *Bioorganic & medicinal chemistry letters* **2018**, *28*, 476-481, <https://doi.org/10.1016/j.bmcl.2017.12.014>.
279. Gopal, M.; Farahana, B.; Pramesh, R. Effectiveness of herbal medications in the treatment of *Acne vulgaris*—A pilot study. *Indian Pract* **2001**, *54*.
280. Kumar, V.; Singh, S.; Singh, A.; Dixit, A.K.; Srivastava, B.; Sidhu, G.K.; Singh, R.; Meena, A.K.; Singh, R.P.; Subhose, V. Phytochemical, antioxidant, antimicrobial, and protein binding qualities of hydro-ethanolic extract of *Tinospora cordifolia*. *Journal of Biologically Active Products from Nature* **2018**, *8*, 192-200, <https://doi.org/10.1080/22311866.2018.1485513>.
281. Miraj, S.; Kiani, S. Study of pharmacological effect of *Verbena officinalis* Linn: A review. *Der Pharmacia Lettre* **2016**, *8*, 321-325.
282. Deepak, M.; Handa, S.S. Antiinflammatory activity and chemical composition of extracts of *Verbena officinalis*. *Phytotherapy Research* **2000**, *14*, 463-465, [https://doi.org/10.1002/1099-1573\(200009\)14:6%3C463::AID-PTR611%3E3.0.CO;2-G](https://doi.org/10.1002/1099-1573(200009)14:6%3C463::AID-PTR611%3E3.0.CO;2-G).
283. Yaorong, L. Inhibitory effects of botanical extracts on the growth, biofilm and lipase activity of acne-causing bacteria. Masters, National Taiwan Normal University, College of Education, Department of Human Development and Family Studies, 2011.
284. Stojković, D.; Soković, M.; Glamočlija, J.; Džamić, A.; Ćirić, A.; Ristić, M.; Grubišić, D. Chemical composition and antimicrobial activity of *Vitex agnus-castus* L. fruits and leaves essential oils. *Food Chemistry* **2011**, *128*, 1017-1022, <https://doi.org/10.1016/j.foodchem.2011.04.007>.
285. Ađalar, H.G.; Çiftçi, G.A.; Gögera, F.; Kurmera, N. The LC/ESI-MSMS profiles and biological potentials of *Vitex agnus castus* extracts. *Natural product communications* **2016**, *11*, <https://doi.org/10.1177%2F1934578X1601101108>.
286. Ghosh, V.; Nagore, D.; Kadbhane, K.; Patil, M. Different approaches of alternative medicines in *Acne vulgaris* treatment. *Oriental Pharmacy & Experimental Medicine* **2011**, *11*, 1-9, <https://doi.org/10.1007/s13596-011-0006-6>.
287. Balakrishnan, K.; Narayanaswamy, N.; Subba, P.; Poornima, E. Antibacterial activity of certain medicinal plants against acne-inducing bacteria. *Int J Pharma Bio Sci* **2011**, *2*, 476-481.
288. Kulkarni, R.; Virkar, A.; D'mello, P. Antioxidant and antiinflammatory activity of *Vitex negundo*. *Indian journal of pharmaceutical sciences* **2008**, *70*.
289. Kumar, P.P.; Kumaravel, S.; Lalitha, C. Screening of antioxidant activity, total phenolics and GC-MS study of *Vitex negundo*. *African Journal of Biochemistry Research* **2010**, *4*, 191-195.
290. Gautam, L.; Shrestha, S.; Wagle, P.; Tamrakar, B. Chemical constituents from *Vitex negundo* (Linn.) of nepalese origin. *Scientific world* **2008**, *6*, 27-32, <https://doi.org/10.3126/sw.v6i6.2630>.