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A REVIEW ON MEDICINAL PLANTS USED IN ANTI-ACNE VULGARIS ACTIVITY

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ABSTRACT

Acne vulgaris is a chronic inflammatory disorder of the pilosebaceous unit that predominantly affects adolescents and young adults worldwide. The long-term use of conventional anti-acne medications is often associated with adverse effects, including skin irritation, dryness, and the emergence of antimicrobial resistance. Consequently, there is increasing interest in the development of plant-based therapeutic alternatives with improved safety profiles and therapeutic efficacy. This review provides a comprehensive overview of fifteen medicinal plants reported to possess antibacterial activity relevant to acne management. Information regarding botanical family, biological source, plant part used, extraction method, bioassay employed, and antibacterial activity expressed as zone of inhibition has been systematically compiled. The reviewed studies demonstrate that various plant extracts, including methanolic, ethanolic, aqueous, and essential oil preparations, exhibit significant inhibitory effects against acne-associated microorganisms such as *Cutibacterium acnes*, *Staphylococcus aureus*, and *Staphylococcus epidermidis*. By critically summarizing the available experimental evidence, this review highlights the antibacterial potential of medicinal plants and supports their prospective application as natural therapeutic agents in the management of acne vulgaris.

KEYWORDS: Acne vulgaris; Medicinal plants; Antibacterial activity; Herbal therapeutics; *Cutibacterium acnes*; Anti-acne agents.

INTRODUCTION

Acne vulgaris has been known as a skin condition since early human civilization. Ancient societies such as the Egyptians, Greeks, and Romans considered acne to be associated with spiritual disharmony or general ill health rather than a distinct medical disorder. Egyptian practitioners commonly applied sulfur-containing remedies, while Greek and Roman physicians documented acne-like skin eruptions and linked them to hair follicles and the adolescent stage of life.[1]

The word acne is derived from the Greek term acme, meaning “summit” or “bloom,” symbolizing the peak of youth. Over time, transcription inaccuracies altered the spelling to its current form. In the 18th and 19th centuries, medical professionals including Daniel Turner, Robert Willan, and Thomas Bateman made significant contributions by classifying acne as a separate dermatological condition and differentiating it from otherskin diseases. Advances in the 20th century led to the identification of increased sebum secretion, follicular obstruction, bacterial involvement (Cutibacterium acnes), and inflammation as the primary factors responsible for acne development.[1]

Acne vulgaris is a long-standing inflammatory condition involving the pilosebaceous unit and commonly affects adolescents and young adults across the world. It is characterized by the presence of comedones, papules, pustules, and cystic lesions, predominantly occurring on sebaceous areas such as the face, chest, and back.

Acne vulgaris ranks among the most prevalent dermatological disorders globally and affects a substantial proportion of individuals from the teenage years through early adulthood. Data from global burden assessments indicate that acne vulgaris contributes to millions of disability-adjusted life years, with a rising prevalence observed in many regions, making it a

notable public health concern due to both its widespread occurrence and psychosocial consequences.[2]

Although acne vulgaris is a non-life-threatening condition, it can markedly reduce quality of life by negatively influencing self-confidence and causing psychological stress, particularly during adolescence.[3] The development of acne is complex and multifactorial, involving excessive sebum secretion, abnormal follicular keratinization, proliferation of Cutibacterium acnes (previously known as Propionibacterium acnes), and subsequent inflammatory processes.[4]

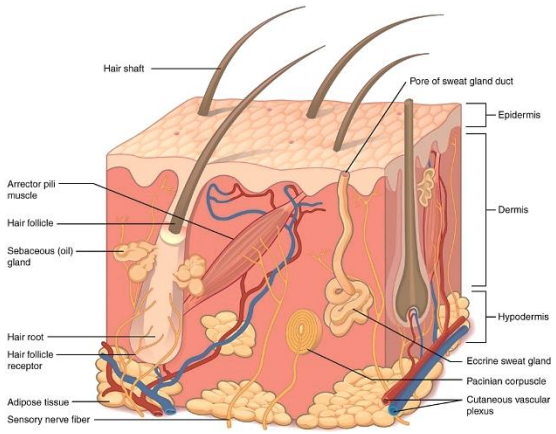
Standard therapeutic approaches such as topical retinoids, antibiotics, benzoyl peroxide, and systemic isotretinoin are generally effective; however, they are frequently associated with adverse effects like skin irritation and dryness, and long-term use may lead to antibiotic resistance and poor patient compliance.[3] The World Health Organization (WHO) recognizes acne vulgaris as one of the most prevalent skin disorders worldwide under non-communicable skin diseases. WHO-supported Global Burden of Disease studies identify acne vulgaris as a leading cause of years lived with disability, particularly among adolescents and young adults.[5]Worldwide, acne is estimated to affect about 9.4 % of the global population, making it one of the most common dermatologic conditions globally.[6]

Owing to these drawbacks, increasing attention has been directed toward the use of medicinal plants and phytochemicals as alternative or supportive therapies for acne vulgaris. Herbal remedies have a long history of traditional use in various cultures and are believed to exhibit antimicrobial, anti-inflammatory, antioxidant, and sebum-regulating properties, enabling them to act on multiple pathogenic factors of acne while producing fewer side effects.[7]

Experimental and clinical evidence suggests that plant-derived extracts such as tea tree oil, turmeric, neem, and green tea demonstrate notable anti-acne potential by suppressing acne-associated microorganisms and reducing inflammatory responses.[8] Nevertheless, further research focusing on standardization, quality assurance, and well-designed clinical trials is essential to validate the safety and efficacy of these herbal treatments as dependable alternatives or adjuncts to conventional acne therapy.

ANATOMY OF SKIN

The skin is the largest organ in the human body and forms an important part of the integumentary system. It is made up of three primary layers, each of which has a specific function in protection, sensation, and regulation of body temperature.[9]



EPIDERMIS

This is the outermost layer of the skin. It acts as a protective shield against physical injury, microorganisms, and harmful substances. The epidermis is made up of different cell types such as keratinocytes (responsible for keratin production), melanocytes (responsible for skin.[10]

pigmentation), and immune cells that help defend the body. In thick skin areas like the palms and soles, the epidermis consists of five layers: stratum basale, stratumspinosum, stratum granulosum, stratum lucidum, and stratum corneum.

DERMIS

This layer lies beneath the epidermis and provides structural support to the skin. It contains connective tissue, blood vessels, nerves, hair follicles, sweat glands, and sebaceous glands, which contribute to strength, nourishment, sensation, and elasticity of the skin. The dermis is divided into two regions: the papillary layer, which is superficial and composed of loose connective tissue, and the reticular layer, which is deeper and made of dense connective tissue.[11]

HYPODERMIS (SUBCUTANEOUS LAYER)

The deepest region of the skin is made up of subcutaneous tissue situated below the dermal layers. It mainly consists of adipose tissue and connective tissue, providing insulation, cushioning, and energy storage.

Although it is not always considered a true skin layer, it plays a vital role in anchoring the skin to the underlying muscles and bones.

COMMON SKIN DISEASES

Skin disorders represent one of the most widespread health problems globally and affect people across all age groups. These conditions may vary from mild and temporary manifestations to chronic, persistent disorders that can adversely influence an individual's physical, psychological, and social well-being. The development of common skin diseases is influenced by multiple factors, including hormonal variations, microbial infections (bacterial, fungal, and viral), immune system

abnormalities, genetic susceptibility, and environmental exposure. Prompt identification and appropriate therapeutic intervention play a crucial role in minimizing disease progression, complications, and permanent skin damage.[12]

Among the frequently reported dermatological conditions are acne vulgaris, eczema, psoriasis, fungal infections, dermatitis, and bacterial skin infections. Collectively, these disorders contribute significantly to the global burden of disease and account for a substantial proportion of outpatient visits to dermatology clinics.

TYPES OF COMMON SKIN DISEASES[13]

Acne Vulgaris – A chronic inflammatory condition involving the pilosebaceous unit, characterized by the presence of comedones, papules, pustules, and, in severe cases, nodules.

Atopic Dermatitis (Eczema) – A recurrent inflammatory skin disorder marked by severe itching, dryness, and erythema.

Psoriasis – A long-term immune-mediated disease characterized by well-defined erythematous plaques covered with silvery-white scales.

Fungal Infections (Tinea/Dermatophytosis) – Superficial infections caused by dermatophyte fungi, affecting the skin, hair, and nails.

Contact Dermatitis – An inflammatory response of the skin triggered by direct contact with irritants or allergenic substances.

Impetigo – A highly contagious superficial bacterial infection, predominantly observed in pediatric populations.

Urticaria (Hives) – An allergic or hypersensitivity reaction presenting as transient, raised wheals accompanied by itching.

ACNE VULGARIS

Acne vulgaris is a long-standing inflammatory disease of the pilosebaceous unit, which includes the hair follicle, hair shaft, and sebaceous gland. It develops when follicles become obstructed and inflamed, resulting in various skin lesions such as come-ons (blackheads and whiteheads), papules, pustules, nodules, and cysts. The condition mainly affects regions rich in sebaceous glands, particularly the face, trunk, and back.[14]

CLASSIFICATION

Acne vulgaris is commonly classified according to the anatomical site affected by the bacterial infection.[15]

Papules (small, red, raised lesions)	
Pustules (pus-filled lesions)	
Nodules (large, painful, solid lesions)	

Cystic lesions (deep, pus-filled, often leading to scarring)	
Whiteheads (closed comedones)	
Blackheads (open comedones)	

Blackheads (Open Comedowns)
Blackheads are non-inflammatory acne lesions formed when excess sebum and dead keratinized cells accumulate within hair follicles. Because the follicular opening remains exposed to air, oxidation of the trapped material gives the lesion a dark brown or black appearance. Blackheads are generally considered a mild form of acne and commonly occur on the face, neck, chest, shoulders, arms, and upper back.[16]

Whiteheads (Closed Comedowns)
Whiteheads are non-inflammatory acne lesions characterized by small, white or flesh-colored bumps that develop when oil, bacteria, and dead skin cells block the follicular opening. Unlike blackheads, the pore remains closed, preventing oxidation. Whiteheads can appear anywhere on the body but are most frequently observed in the facial T-zone, including the forehead, nose, and chin.[16]

Papules
Papules are small, inflamed acne lesions that arise due to bacterial proliferation, increased sebum production, and hormonal influences. Inflammation presents with redness, swelling, warmth, and tenderness. Clinically, papules appear as solid, pink or red elevations on the skin surface, typically measuring less than 5 mm in diameter and lacking visible pus. Papules represent a transitional stage between non-inflammatory and inflammatory acne lesions.[16]

Pustules
Pustules are inflammatory acne lesions resulting from clogged follicles filled with purulent material. They present as raised lesions with a central collection of pus, often surrounded by erythematous and inflamed skin. Pustules commonly develop on the face, chest, back, shoulders, neck, hairline, and other sebaceous gland–rich areas of the body.[16]

Nodules
Acne nodules are severe inflammatory lesions that form when follicular blockage and bacterial infection extend into deeper layers of the skin. They appear as firm, painful, and inflamed lumps with diameters typically exceeding 5–10 mm. Nodules often persist for extended periods and do not respond adequately to over-the-counter treatments. They are commonly observed along the jawline, chin, and facial regions and may result in permanent scarring if untreated.[16]

Cysts lesions
Cystic acne is a severe form of inflammatory acne characterized by deep-seated, pus-filled lesions caused by extensive blockage of follicles with oil, bacteria, and dead skin cells. These lesions are often large, painful, and prone to rupture, increasing the risk of scarring. Cystic acne frequently affects individuals with oily skin and commonly involves the face, chest, shoulders, back, neck, and arms. Patients often exhibit a combination of inflammatory and non-inflammatorylesions.[16]

ETIOLOGY

Acne vulgaris is a chronic inflammatory disorder of the pilosebaceous unit, commonly affecting adolescents and young adults. The condition develops due to the complex interaction of multiple etiological factors, including hormonal imbalance, excessive sebum production, abnormal keratinization, microbial colonization, inflammation, genetic susceptibility, and environmental influences. These factors act together to initiate and aggravate acne lesions.

EPIDEMIOLOGY

Acne vulgaris is among the most prevalent dermatological disorders globally. It occurs most frequently during adolescence and early adulthood but may persist or appear later in adult life. The disease affects individuals of both genders and occurs across nearly all ethnic populations.[14]

PATHOGENESIS

The pathophysiology of acne vulgaris is complex and multifactorial, involving several interconnected mechanisms Excessive sebum secretion stimulated by androgens acting on sebaceous glands.

Follicular hyperkeratinization, leading to accumulation of corneocytes and blockage of the pilosebaceous duct. Proliferation of Cutibacterium acnes (formerly Propionibacterium acnes), a normal skin commensal that contributes to inflammation. Activation of inflammatory pathways due to follicular rupture and bacterial metabolites.[17]

CLINICAL FEATURES

Clinically, acne presents with a spectrum of lesions ranging from non-inflammatory comedones to inflammatory papules, pustules, nodules, and cystic lesions. The severity of the disease may range from mild, with occasional eruptions, to severe forms associated with permanent scarring and tissue damage.[18]

PSYCHOLOGICAL & SOCIAL IMPACT

While acne vulgaris is not a fatal condition, it can cause considerable psychological and social burden. Patients often experience reduced self-confidence, emotional distress, anxiety, and a diminished quality of life, with impacts sometimes comparable to those seen in chronic systemic illnesses.[17]

NATURAI HISTORY

Acne typically begins during puberty due to increased sebaceous gland activity; however, lesions may persist, recur, or newly develop during adulthood. No single causative factor has been identified, and susceptibility is influenced by a combination of genetic, hormonal, and environmental factors**.**

PREVALENCE

Acne vulgaris ranks among the most widespread skin conditions worldwide. Research indicates that it affects approximately 35–100% of teenagers during adolescence and has an overall global prevalence of around 9.4% across all age groups.[19]

Major Physical and Cosmetic Effects

Acne manifests as blocked pores, pimples, blackheads, whiteheads, and sometimes deeper inflammatory lesions such as nodules and cysts. While it is generally not life-threatening, these skin changes can result in permanent scarring and marks if left untreated.[20]

Psychological and Social Importance

Acne is associated with lower self-esteem, embarrassment, anxiety, depression, and social isolation, particularly among adolescents and young adults.[21]

Educational & Healthcare Relevance Due to its high prevalence and impact, acne is a key area in dermatology, mental health research, and public health education. Management strategies include clinical treatments, lifestyle modifications, and psychological support.[22]

HERBAL SOURCE EXHIBITING ACTIVITY AGAINST ACNE VULGARIS

1. ALOE VERA (Aloe barbadensis Miller)[23]

i. Part Used: Leaf gel
ii. Extracted With: Ethanolic, Methanolic, Aqueous
iii. Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus Epidermidis.
v. Method of Assay: Agar well diffusion method.
vi. Result Reported:[23] Methanolic extract exhibited moderate antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	8±0.4mm	9±0.4mm
Methanolic	12±0.5mm	11±0.4mm
Aqueous	15±0.3mm	14±0.3mm

DESCRIPTION[24]

Aloe vera belongs to the family Asphodelaceae and is widely used for dermatological applications. The gel contains biologically active compounds such as aloins,

aloesin, polysaccharides, flavonoids, vitamins, and amino acids. Aloe vera shows antibacterial, wound-healing, anti-inflammatory, and moisturizing properties, making it highly beneficial in acne management by reducing inflammation and promoting skin repair.

2. NEEM (Azadirachta indica)[25]

i. Part Used: Leaf
ii. Extracted With: Ethanolic, Methanolic, Aqueous
iii. Anti- acne vulgaris Activity Test: Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[25] Ethanolic and methanolic extracts showed higher antibacterial activity against acne-causing microorganisms.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	10±0.5mm	11±0.4mm
Methanolic	16±0.6mm	15±0.5mm
Aqueous	20±0.4mm	18±0.3mm

DESCRIPTION[26]
Neem is a well-known medicinal plant belonging to the family Meliaceae and is widely used in traditional and modern medicine. Various parts of the plant such as leaves, bark, seeds, and oil contain bioactive constituents including nimbin, nimbolide, azadirachtin, salannin, and quercetin. Neem exhibits significant antibacterial, anti-inflammatory, antifungal, and antioxidant activities. Due to its strong inhibitory effect against acne-causing bacteria, neem is extensively used in anti-acne formulations and herbal cosmetics.

3. TURMERIC (Curcuma longa)[27]

i. Part Used: Rhizome
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii.Anti-Acne vulgaris Activity Test: Anti-acne / Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[27] Methanolic extract showed maximum inhibition against both microorganisms.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	18±0.5mm	19±0.5mm
Methanolic	22±0.6mm	23±0.6mm
Aqueous	14±0.4mm	15±0.4mm

DESCRIPTION[28]
Turmeric is an important medicinal plant of the family Zingiberaceae, traditionally used in Ayurvedic medicine. The major bioactive constituent curcumin exhibits strong antibacterial, anti-inflammatory, antioxidant, and antiseptic activities. Turmeric is effective against acne-associated microorganisms and helps in reducing redness, swelling, and post-acne pigmentation.

4. LICORICE (Glycyrrhiza glabra)[29]

i. Part Used: Root
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii. Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[29] Methanolic extract showed significant antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	15±0.5mm	14±0.4mm
Methanolic	19±0.6mm	20±0.5mm
Aqueous	9±0.3mm	10±0.4mm

DESCRIPTION[30]
Licorice belongs to the family Fabaceae and is widely used in herbal medicine and cosmetics. The root contains active compounds such as glycyrrhizin, liquiritin, glabridin, and flavonoids. Licorice exhibits antibacterial,

anti-inflammatory, and skin-lightening properties and is useful in acne treatment by reducing irritation, bacterial growth, and hyperpigmentation.

5. MULTANI MITTI (Fuller's earth)[31]

i. Part Used: Mineral clay
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii. Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[31] Ethanolic extract showed better antibacterial activity than aqueous extract.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	11±0.4mm	10±0.4mm
Methanolic	14±0.5mm	13±0.5mm
Aqueous	7±0.3mm	8±0.3mm

DESCRIPTION[32]
Multani mitti is a naturally occurring clay rich in aluminium silicate, magnesium, calcium, and iron oxides. It has excellent adsorbent, cleansing, and oil-absorbing properties. Multani mitti helps in removing excess sebum, unclogging pores, and reducing bacterial load on the skin, making it a common ingredient in herbal anti-acne formulations.

6. GREEN TEA (Camellia sinensis)[33]

i. Part Used: Leaves
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii. Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[33] Methanolic extract exhibited maximum inhibition.

Extract	Cutibacterium Acnes	Staphylococcus Epidermidis
Ethanolic	18±0.6mm	17±0.5mm
Methanolic	20±0.7mm	19±0.6mm
Aqueous	15±0.5mm	14±0.4mm

DESCRIPTION[34]
Green tea belongs to the family Theaceae and is rich in polyphenols, particularly epigallocatechin-3-gallate (EGCG). It exhibits potent antibacterial, anti-inflammatory, and antioxidant activities. Green tea has been reported to reduce sebum production and inhibit acne-causing bacteria, making it effective in acne vulgaris management.

7. TEA TREE (Melaleuca alternifolia)[35]

i. Part Used: Leaves
ii. Extracted With: Essential oil, Ethanolic
iii. Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[35] Essential oil showed strong antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	20.85±0.76mm	21.02±0.73mm
Essential oil	21.85±0.76mm	22.0.2±0.73mm

DESCRIPTION[36]
Tea tree belongs to the family Myrtaceae and is widely used in dermatological preparations. The essential oil contains active constituents such as terpinen-4-ol, α-terpineol, cineole, and limonene. Tea tree oil exhibits

strong antibacterial, anti-inflammatory, and antiseptic properties and is highly effective against acne-causing microorganisms, particularly Cutibacterium acnes.

8. GOTU KOLA (Centella asiatica)[37]

i. Part Used: Leaves
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii. Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[37] Methanolic extract showed moderate antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	14mm	15mm
Methanolic	17mm	18mm
Aqueous	10mm	11mm

DESCRIPTION[38]
Gotu kola belongs to the family Apiaceae and is an important medicinal herb in Ayurveda. It contains bioactive compounds such as asiaticoside, madecassoside, asiatic acid, and flavonoids. The plant shows antibacterial, wound-healing, antioxidant, and anti-inflammatory activities, supporting its role in acne treatment and scar reduction.

9. CLOVE (Syzygium aromaticum)[39]

i. Part Used: Flower buds
ii. Extracted With: Ethanolic, Methanolic, Essential oil
iii. Anti-Acne vulgaris Activity Test: Anti-acne / Antibacterial
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[39] Methanolic extract exhibited strong antibacterial activity due to eugenol.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	19mm	20mm
Methanolic	22mm	23mm
Essential oil	24mm	18.96mm

DESCRIPTION[40]
Clove belongs to the family Myrtaceae and is rich in essential oils. The major active compound eugenol exhibits strong antibacterial, antifungal, antioxidant, and anti-inflammatory properties. Clove extracts are effective against acne-causing bacteria and help in reducing skin infections.

10. HOLY BASIL (Ocimum sanctum)[41]

i. Part Used: Leaves.
ii. Extracted With: Aqueous, Ethanolic, Methanolic, Essential oil.
iii. Anti-Acne vulgaris Activity Test: Anti-acne / Antibacterial.
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis.
v. Method of Assay: Agar well diffusion method.
vi. Result Reported:[41] Methanolic extract showed higher antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	16mm	17mm
Methanolic	19mm	20mm
Essential oil	22mm	23mm
Aqueous	11mm	12mm

DESCRIPTION[42]
Holy basil belongs to the family Lamiaceae and is widely used in traditional medicine. The leaves contain eugenol,

ursolic acid, rosmarinic acid, and flavonoids. Tulsi exhibits potent antibacterial, anti-inflammatory, antioxidant, and immunomodulatory properties and is effective against acne-associated bacteria.

11. CALENDULA (Calendula officinalis)[43]

i. Part Used: Flowers
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii. Anti-Acne vulgaris Activity Test: Anti-acne / Antibacterial
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[43] Methanolic extract exhibited significant inhibition.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	14mm	15mm
Methanolic	18mm	19mm
Aqueous	9mm	10mm

DESCRIPTION[44]
Calendula belongs to the family Asteraceae and is commonly used in herbal skin care products. The flowers contain triterpenoids, flavonoids, carotenoids, and essential oils. Calendula shows antibacterial, anti-inflammatory, wound-healing, and soothing effects, making it suitable for inflamed acne lesions.

12. SANDALWOOD (Santalum album)[45]

i. Part Used: Heartwood
ii. Extracted With: Ethanolic, Methanolic, Essential oil, Aqueous
iii. Anti-Acne vulgaris Activity Test: Antibacterial /Anti-acne
iv.Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v.Method of Assay: Agar well diffusion method
vi.Result Reported:[45] Essential oil showed strong antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	16mm	17mm
Methanolic	20mm	21mm
Essential oil	23mm	24mm
Aqueous	10mm	11mm

DESCRIPTION[46]
Sandalwood belongs to the family Santalaceae and is valued for its aromatic and medicinal properties. The heartwood oil contains α-santalol and β-santalol, which exhibit antibacterial, anti-inflammatory, and cooling effects. Sandalwood is traditionally used to reduce acne, skin irritation, and microbial infections.

13. HEMIDESMUS (Hemidesmus indicus)[47]

i. Part Used: Root
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii. Anti-Acne vulgaris Activity Test: Anti-acne / Antibacterial
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[47] Methanolic extract showed moderate to significant antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	15mm	16mm
Methanolic	18mm	19mm
Aqueous	10mm	11mm

DESCRIPTION[48]
Hemidesmus belongs to the family Apocynaceae and is an important Ayurvedic medicinal plant. The roots contain hemidesmin, saponins, tannins, and flavonoids. It possesses antibacterial, anti-inflammatory, blood-

purifying, and antioxidant properties and is traditionally used in acne and skin disorders.

14. ABUTILON INDICA (Abutilon indicum)[49]

i. Part Used: Leaves
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii. Anti-Acne vulgaris Activity Test: Anti-acne / Antibacterial
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[49] Methanolic extract exhibited significant antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	15mm	16mm
Methanolic	18mm	19mm
Aqueous	10mm	11mm

DESCRIPTION[50]
Abutilon indica belongs to the family Malvaceae and is widely used in traditional medicine. The plant contains bioactive compounds such as flavonoids, alkaloids, phenolics, glycosides, and sterols. It exhibits antibacterial, anti-inflammatory, antioxidant, and wound-healing properties, making it useful in the treatment of acne and other inflammatory skin disorders.

15. INDIAN ACALYPHA (Acalypha indica)[51]

i.Part Used: Leaves
ii.Extracted With: Aqueous, Ethanolic, Methanolic
iii.Anti-Acne vulgaris Activity Test: Anti-acne / Antibacterial
iv.Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v.Method of Assay: Agar well diffusion method
vi.Result Reported:[51] Methanolic extract showed higher inhibition compared to other solvents.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	16mm	17mm
Methanolic	19mm	20mm
Aqueous	11mm	12mm

DESCRIPTION[52]
Acalypha indica belongs to the family Euphorbiaceae and is commonly used in Ayurveda and Siddha medicine. The plant is rich in flavonoids, tannins, alkaloids, phenols, and saponins. It possesses antibacterial, anti-inflammatory, antifungal, and antioxidant activities and has been traditionally used for treating acne, skin infections, and wounds.

16. LEMON (Citrus limon)[53]

i.Part Used: Peel
ii.Extracted With: Ethanolic, Methanolic, Essential oil, Aqueous
iii. Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv.Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v.Method of Assay: Agar well diffusion method
vi.Result Reported:[53] Ethanolic extract exhibited notable antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	17mm	18mm
Methanolic	19mm	20mm
Essential oil	22mm	23mm
Aqueous	10mm	11mm

DESCRIPTION[54]
Lemon belongs to the family Rutaceae and is widely used in herbal cosmetics. The peel and juice contain citric acid, vitamin C, flavonoids, and limonene. Lemon

exhibits antibacterial, antioxidant, and astringent properties and helps in controlling sebum production and acne-causing microorganisms.

17. ROSA (Rosa damascena)[55]

i.Part Used: Petals
ii.Extracted With: Aqueous, Ethanolic, Methanolic, Essential oil
iii.Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv.Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[55] Ethanolic and methanolic extracts showed moderate antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	14mm	15mm
Methanolic	17mm	18mm
Essential oil	20mm	21mm
Aqueous	9mm	10mm

DESCRIPTION[56]
Rose belongs to the family Rosaceae and is widely used in cosmetic and dermatological preparations. The petals contain flavonoids, phenolic acids, anthocyanins, and essential oils. Rose exhibits antibacterial, anti-inflammatory, soothing, and antioxidant properties, which help in reducing acne-related inflammation and skin irritation.

18)MANJISTHA (Rubia cordifolia)[57]

i. Part Used: Root
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii. Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[57] Methanolic extract showed higher antibacterial activity against acne-causing microorganisms.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	17±0.6mm	17±0.5mm
Methanolic	19±0.4mm	20±0.6mm
Aqueous	11±0.3mm	12±0.4mm

DESCRIPTION[58]
Manjistha belongs to the family Rubiaceae and is an important Ayurvedic medicinal plant. The roots contain bioactive compounds such as purpurin, manjistin, rubiadin, and anthraquinones. It exhibits antibacterial, anti-inflammatory, antioxidant, and blood-purifying properties and is traditionally used in acne, pigmentation, and chronic skin disorders.

19) CHAMOMILE (Matricaria chamomilla)[59]

i. Part Used: Flowers
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii. Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[59] Ethanolic and methanolic extracts exhibited moderate antibacterial activity.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	15±0.5mm	17±0.5mm
Methanolic	17.04mm	18.06mm
Aqueous	11±0.3mm	13±0.4mm

DESCRIPTION[60]
Chamomile belongs to the family Asteraceae and is widely used in herbal medicine. The flowers contain

apigenin, bisabolol, chamazulene, and flavonoids. Chamomile exhibits anti-inflammatory, antibacterial, soothing, and antioxidant effects and is useful in treating inflamed acne lesions and sensitive skin.

20) WITCH HAZEL (Hamamelis virginiana)[61]

i. Part Used: Bark / Leaves
ii. Extracted With: Aqueous, Ethanolic, Methanolic
iii. Anti-Acne vulgaris Activity Test: Antibacterial / Anti-acne
iv. Test Organism: Cutibacterium acnes, Staphylococcus epidermidis
v. Method of Assay: Agar well diffusion method
vi. Result Reported:[61] Methanolic extract showed significant inhibition due to high tannin content.

EXTRACT	Cutibacterium acnes	Staphylococcus epidermidis
Ethanolic	18±0.6mm	20±0.5mm
Methanolic	19±0.4mm	21±0.6mm
Aqueous	10.00mm	11.00mm

DESCRIPTION[62]

Witch hazel belongs to the family Hamamelidaceae and is commonly used in topical skin formulations. It contains tannins, hamamelitannin, flavonoids, and proanthocyanidins. Witch hazel shows astringent, antibacterial, anti-inflammatory, and antioxidant activities, helping to control sebum secretion and acne-causing bacteria.

CONCLUSION

This review highlights the anti-acne potential of various medicinal plants such as Neem (Azadirachta indica), Holy Basil (Ocimum sanctum) and Indian acalypha (Acalypha indica)exhibiting the highest inhibitory activity against acne vulgari. Other plants sach as Aloe vera, Neem, Turmeric, Green tea, Tea tree, Clove, Gotu kola, Calendula, Rosa, and Acalypha indica. The different herbal extracts, especially methanolic, ethanolic extracts and essential oils, exhibit significant antibacterial activity against acne-causing microorganisms like Cutibacterium acnes and Staphylococcus epidermidis. medicinal plants offer a safe, effective, and economical alternative for the management of acne vulgaris.

Considering these findings, several formulation strategies can be adopted for the management of acne vulgaris. The plant extracts may be incorporated into topical dosage forms such as creams, gels, lotions, ointments, or advanced nano-based formulations to enhance stability, skin permeation, and therapeutic effectiveness against acne-causing microorganisms. Despite promising in vitro anti-acne activity, further in vivo studies, standardization, stability, and safety evaluations are necessary for clinical application. Overall, these medicinal plants offer a sustainable and promising approach for effective acne vulgaris management.

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