

A review article on polyherbal anti-acne patches: Herbal ingredients, therapeutic potential and application

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Abstract

The growing occurrence of acne and pimples has created a need for safer, effective, and convenient skincare therapies derived from natural sources. Herbal pimple and acne patches have emerged as a promising approach by integrating the therapeutic properties of medicinal plants with modern transdermal patch technology. These patches deliver active herbal constituents directly to acne-affected areas, helping control inflammation, inhibit microbial growth, and support natural skin healing.

Plant-based ingredients such as tea tree oil, witch hazel, aloe vera, calendula, and other medicinal herbs are commonly incorporated into these patches because of their antibacterial, anti-inflammatory, soothing, and skin-repairing properties. The patch provides localised and prolonged contact between the active ingredients and the affected skin, which may improve treatment efficiency while reducing unnecessary exposure of surrounding healthy skin.

In addition to their therapeutic potential, herbal acne patches are easy to apply, discreet, non-invasive, and convenient for daily use. They may therefore serve as an attractive alternative or complementary approach to conventional oral and topical acne therapies. This review highlights the formulation principles, therapeutic potential, effectiveness, and advantages of herbal pimple and acne patches. It discusses their possible application as a modern approach for promoting clearer and healthier skin.

Keywords: Herbal acne patches, pimple patches, Acne vulgaris, herbal ingredients, medicinal plants, transdermal drug delivery, topical drug delivery, anti-acne activity, antibacterial activity, anti-inflammatory activity, Tea Tree Oil, Aloe Vera, Witch Hazel, Calendula, skin healing, natural skincare, acne treatment, localised drug delivery, herbal formulation, skin health

Introduction

Acne: Acne vulgaris is a common inflammatory disorder of the pilosebaceous unit, which consists of the hair follicle and its associated sebaceous gland. It is particularly common during adolescence, although the condition may continue or develop during adulthood. Acne primarily affects areas containing a high density of sebaceous glands, especially the face, chest, shoulders, and back. The condition may appear as non-inflammatory lesions such as comedones or as inflammatory lesions including papules, pustules, nodules, and cysts. Persistent or severe acne may

also result in post-inflammatory changes and permanent scarring ^[1].

The development of acne is multifactorial rather than being caused by a single factor. Four major processes are generally associated with its pathogenesis: increased sebum production, abnormal follicular keratinisation, proliferation and activity of *Cutibacterium acnes*, and inflammation. Hormonal influences, particularly androgenic stimulation, can increase sebaceous gland activity and contribute to the formation of acne lesions ^[2].



Fig 1: External Acne

Pathogenesis of Acne

The formation of acne lesions begins with changes within the pilosebaceous follicle. Increased secretion of sebum can combine with abnormal shedding of follicular keratinocytes, resulting in obstruction of the follicular opening. This initial obstruction contributes to the development of

microcomedones, which may subsequently progress into visible comedonal or inflammatory lesions ^[3].

The altered follicular environment also supports *C. acnes* growth and activity. The organism can contribute to the inflammatory response through interactions with the host immune system and other components of the follicular

environment. Inflammatory mediators released during this process contribute to lesions such as papules, pustules, nodules, and cysts ^[4].

Thus, acne should be considered a complex disorder involving interactions among sebum production, follicular keratinisation, the cutaneous microbiome, hormonal factors, and inflammatory pathways rather than simply a bacterial skin infection ^[5].

Types of Acne

Based on the nature and severity of the lesions, acne can present in several forms. Commonly encountered types include:

1. Comedonal Acne

Comedonal acne is characterised mainly by non-inflammatory lesions. These may occur as open comedones, commonly called blackheads, or closed comedones, commonly known as whiteheads ^[6].

2. Inflammatory Acne

Inflammatory acne develops when the affected follicles undergo an inflammatory response. Papules and pustules are common manifestations, while more severe inflammation may produce nodules and cysts ^[7].

3. Acne Conglobata

Acne conglobata is an uncommon but severe form of acne characterised by numerous deep inflammatory lesions, nodules, abscess-like lesions, and interconnected lesions. It can produce significant scarring and generally requires medical management ^[8].

4. Acne Mechanica

Acne mechanica may occur when repeated friction, pressure, heat, or occlusion affects the skin. Activities involving helmets, tight clothing, straps, or similar sources of mechanical irritation can contribute to lesion development ^[9].

Factors Contributing to Acne

Several factors may influence acne development or worsening. These factors can act individually or in combination.

1. Increased Sebum Production

Sebaceous glands produce sebum, an oily secretion that normally helps protect the skin. Excessive sebaceous activity can increase the amount of oil within the pilosebaceous follicle and promote the development of acne. Androgenic stimulation is an important regulator of sebaceous gland activity ^[10].

2. Abnormal Follicular Keratinisation

In acne-prone skin, abnormal proliferation and shedding of follicular keratinocytes can contribute to blockage of the follicular opening ^[11]. Accumulation of keratin and sebum may subsequently result in the formation of microcomedones and comedones ^[12].

3. Cutibacterium acnes

C. acnes is a normal component of the skin microbiota, but changes in the follicular environment can favour its proliferation and inflammatory activity. Its involvement in acne is associated with immune activation and inflammatory responses within the pilosebaceous unit ^[13].

4. Hormonal Influences

Hormonal changes can influence sebaceous gland activity and therefore affect acne development. Androgens are particularly important because they stimulate sebaceous gland function. Hormonal fluctuations may therefore contribute to acne during puberty and in some individuals during adulthood ^[14].

5. Diet and Lifestyle

Dietary and lifestyle factors have been investigated for their possible relationship with acne. Evidence suggests that certain dietary patterns may influence acne in susceptible individuals, although the strength of evidence varies among different dietary factors. Stress and inadequate skin-care practices may also aggravate existing acne in some individuals ^[15].

Pimple

A pimple is a visible skin lesion that develops when a pilosebaceous follicle becomes obstructed and, in many cases, undergoes inflammation. Pimples are commonly observed on areas such as the face, chest, shoulders, and back. They may occur as isolated lesions or as part of the broader clinical presentation of acne vulgaris ^[16].

The appearance of a pimple depends on the degree of follicular blockage and inflammation. Small non-inflammatory lesions may remain as comedones, whereas progression of inflammation can result in papules, pustules, nodules, or cysts ^[17].



Fig 2: Pimple

Types of Pimples

1. Whiteheads

Whiteheads are closed comedones formed when the follicular opening remains covered while sebum and keratin accumulate within the follicle ^[18].

2. Blackhead

Blackheads are open comedones in which the follicular contents are exposed to air. The dark appearance is primarily associated with oxidation and changes in the follicular material rather than simply the presence of dirt ^[19].

3. Papules

Papules are small, raised, inflammatory lesions that generally appear red or pink and do not contain visible pus ^[20].

4. Pustules

Pustules are inflammatory lesions containing purulent material. They commonly appear as raised lesions with a visible white or yellow centre surrounded by erythematous skin ^[21].

5. Nodules

Nodules are larger and deeper inflammatory lesions that may be painful. They develop within deeper portions of the skin and may increase the risk of scarring ^[22].

6. Cysts

Cystic acne involves deep, painful inflammatory lesions and can be associated with a higher risk of permanent acne scars. Severe or persistent nodulocystic acne generally requires professional dermatological management ^[23].

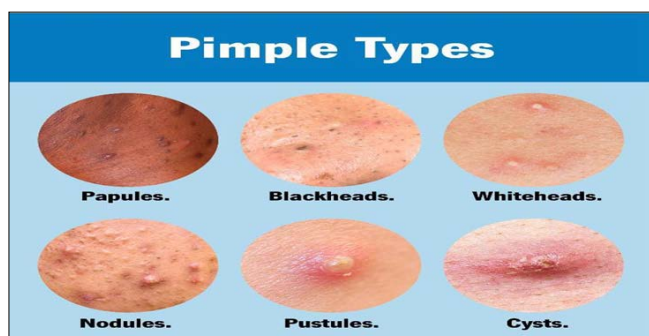


Fig 3: Types of Pimples

Conventional Management of Acne

The management of acne depends on the type, severity, extent of lesions, and individual patient factors. Conventional treatment may involve topical preparations, systemic medicines, or a combination of therapeutic approaches ^[24].

Topical retinoids such as adapalene, tretinoin, tazarotene, and trifarotene are used to normalise follicular keratinisation and help prevent pore blockage. Benzoyl peroxide is used because of its activity against acne-associated bacteria, while salicylic acid can assist in reducing follicular obstruction. Other topical agents, including azelaic acid and selected topical antibiotics, may also be used according to clinical requirements ^[25].

For moderate-to-severe acne, systemic therapy may be considered. Oral antibiotics such as doxycycline, minocycline, or sarecycline may be prescribed in appropriate patients, while hormonal therapies or oral isotretinoin may be considered in selected cases. Current clinical guidance emphasises appropriate combinations of therapies and recommends limiting antibiotic exposure when possible ^[26].

Although conventional treatments can be effective, some patients may experience adverse effects such as dryness, irritation, peeling, burning, or increased sensitivity. These considerations have encouraged continued interest in localised, patient-friendly delivery systems and complementary approaches for acne management ^[27].

Pimple and Acne Patches

Pimple patches, also referred to as acne or blemish patches, are small adhesive preparations designed to be placed directly over individual acne lesions. They are intended to provide localised treatment while creating a protective covering over the affected area ^[28].

Depending on their formulation, acne patches may contain hydrocolloid materials, conventional active pharmaceutical ingredients, herbal constituents, or combinations of different components. Hydrocolloid systems can absorb wound exudate and maintain a moist environment over superficial lesions, whereas medicated patches may additionally provide active ingredients to the targeted skin area ^[29].

The localised nature of a patch offers several potential advantages. It can maintain close contact with the lesion, protect the affected area from external contamination and repeated touching, and provide a convenient method of application. The use of a patch may also improve patient acceptance because of its discreet and easy-to-use design ^[30].

Herbal Pimple and Acne Patches

Herbal acne patches combine plant-derived bioactive constituents with localised patch-based delivery systems. The concept is based on utilising the biological properties of medicinal plants while delivering their constituents directly to the acne-affected region ^[31].

Plant-derived materials such as tea tree oil, aloe vera, witch hazel, and calendula have been investigated or incorporated into topical skin-care preparations because of reported antimicrobial, anti-inflammatory, soothing, or skin-conditioning properties. However, the activity of an individual herbal ingredient depends on its composition, concentration, formulation, stability, and method of application ^[32].

A patch-based system may help maintain prolonged contact between the formulation and the target area. Compared with a conventional cream or gel that can be easily removed through touching or rubbing, an adhesive patch remains positioned over the lesion for a defined period. This may support localised exposure while reducing unnecessary application over unaffected areas ^[33].



Fig 4: Acne Patch

Advantages of Herbal Acne Patches

Herbal acne patches may provide several formulation and patient-use advantages:

1. **Localised application:** The formulation can be positioned directly over the acne lesion ^[34].
2. **Prolonged contact:** The adhesive system can maintain contact with the affected skin for a specified period ^[35].
3. **Convenient administration:** Patches are simple to apply and do not generally require repeated rubbing into the skin ^[36].

4. **Discreet appearance:** Small patches can be used without applying large quantities of topical preparation [37].
5. **Protection of the lesion:** The patch can act as a physical barrier against repeated touching or picking [38].
6. **Potential reduction of surrounding exposure:** Targeted placement may limit application to healthy skin [39].
7. **Combination of herbal and delivery-system benefits:** Medicinal plant constituents can be incorporated into a modern localised dosage form [40].

Nevertheless, herbal acne patches should not automatically be considered superior to established acne therapies. Their effectiveness depends on the selected plant materials, active constituents, formulation design, dose, stability, skin compatibility, and clinical evidence supporting their use [41].

Rationale for Herbal Acne Patch Development

The continuing demand for convenient and localised acne-care products has encouraged the development of alternative topical delivery systems. Incorporating herbal constituents into an adhesive patch provides an opportunity to combine plant-derived bioactive compounds with controlled and localised application [42].

A properly designed herbal acne patch should possess suitable adhesion, flexibility, physical stability, drug or phytoconstituent compatibility, skin acceptability, and appropriate release characteristics. Evaluation of these properties is necessary before determining the therapeutic potential of the formulation [43].

Therefore, the development of polyherbal acne patches represents an interesting area of pharmaceutical research, particularly for exploring the combination of multiple plant-derived constituents in a localised delivery system. Further formulation studies, standardisation of herbal materials, stability assessment, and well-designed clinical investigations are necessary to establish their efficacy and safety [44].

Table 1: Common Herbal Ingredients Used in Polyherbal Anti-Acne Patches [46]

Herbal Ingredient	Scientific Name	Common Form Used	Main Role in Anti-Acne Patch
Tea Tree	<i>Melaleuca alternifolia</i>	Essential oil / Extract	Antibacterial and anti-inflammatory
Aloe Vera	<i>Aloe barbadensis</i>	Gel / Extract	Soothing, moisturising and wound healing
Neem	<i>Azadirachta indica</i>	Leaf extract	Antibacterial and anti-inflammatory
Turmeric	<i>Curcuma longa</i>	Rhizome extract / Curcumin	Anti-inflammatory and antioxidant
Witch Hazel	<i>Hamamelis virginiana</i>	Extract	Astringent and soothing
Calendula	<i>Calendula officinalis</i>	Flower extract	Anti-inflammatory and skin-healing
Green Tea	<i>Camellia sinensis</i>	Leaf extract	Antioxidant and anti-inflammatory
Licorice	<i>Glycyrrhiza glabra</i>	Root extract	Anti-inflammatory and skin-soothing
Tulsi	<i>Ocimum tenuiflorum</i>	Leaf extract	Antimicrobial and antioxidant
Manjistha	<i>Rubia cordifolia</i>	Root extract	Traditionally used for inflammatory skin conditions



Fig 5: Herbal Ingredients

Detailed description of herbals

1. Tea tree

Scientific Name: *Melaleuca alternifolia* (Maiden & Betche) Cheel

General name: Tea Tree

Biological source: Dried leaves and terminal branches /essential oil of *Melaleuca alternifolia*.

Major Uses: Antimicrobial, anti-inflammatory, wound healing, skin cleansing.

Role in Anti-Acne Patches: Helps to reduce acne-causing bacteria, inflammation of acne, wound healing, and reduce swelling and redness. [47]

Tea tree (*Melaleuca alternifolia*) is a medicinal plant belonging to the family Myrtaceae. The essential oil obtained mainly from the leaves and terminal branches is widely used in herbal and cosmetic preparations. Tea tree oil contains bioactive constituents, particularly terpinen-4-ol, which is associated with antimicrobial and anti-inflammatory properties. It may help control microorganisms associated with acne and reduce inflammation, redness, and swelling of acne lesions. In an anti-acne patch, tea tree oil can provide localised activity at the affected area and may support the healing of pimples. Its incorporation into a patch can also reduce direct exposure of the surrounding skin compared with applying the active ingredient over a larger area [48].



Fig 6: Tea Tree

2. Aloe Vera

Scientific Name: *Aloe barbadensis* Mill.

General Name: Aloe vera / Ghritkumari

Biological source: Fresh leaves/leaf gel of *Aloe barbadensis*

Major uses: Moisturising, soothing, wound healing, anti-inflammatory

Role in Anti Acne Patches: Provides a soothing and moisturising effect, reduces irritation and inflammation and supports skin repair [49].

Aloe vera (*Aloe barbadensis*) is a succulent medicinal plant belonging to the family Asphodelaceae. The inner gel obtained from the fresh leaves is commonly used in pharmaceutical, cosmetic, and herbal preparations. Aloe vera contains polysaccharides, vitamins, enzymes, amino acids, and other bioactive substances that contribute to its soothing, moisturising, and skin-supporting properties. It is traditionally used for minor skin irritation, wounds, and

inflammatory skin conditions. In anti-acne patches, aloe vera can help soothe irritated skin, reduce the feeling of inflammation, maintain skin hydration, and support the natural healing process of acne-affected areas. Its moisturising property can also help improve the comfort of the patch [50].



Fig 7: Aloe Vera

3. Neem

Scientific Name: *Azadirachta indica* A. Juss.

General Name : Neem /indan lilac

Biological source: Leaves, bark and other parts of *Azadirachta indica*

Major uses: Antimicrobial, anti-inflammatory, antioxidant, skin cleansing

Role in Anti-Acne Patches: Helps control **microbial growth**, inflammation and excess skin irritation associated with acne [50].

Neem (*Azadirachta indica*) is an important medicinal plant belonging to the family Meliaceae and is commonly known as Indian lilac. Leaves, bark, seeds, and other parts of the plant are traditionally used in herbal medicine. Neem contains several biologically active compounds, including limonoids and other phytoconstituents, which contribute to its antimicrobial, anti-inflammatory, and antioxidant properties. Neem is traditionally used for various skin problems and for maintaining skin cleanliness. In an anti-acne patch, neem extract may help control microbial growth around acne lesions and reduce inflammation and irritation. Its antioxidant properties may also help protect the skin from oxidative stress associated with inflammatory skin conditions [50].



Fig 8: Neem

4. Turmeric

Scientific Name: *Curcuma longa* L.

General Name: Turmeric / Haldi

Biological source: Dried rhizomes of *Curcuma longa*

Major uses: Anti-inflammatory, antioxidant, antimicrobial, wound healing

Role in Anti-Acne Patches: Helps reduce inflammation, redness and oxidative stress around acne lesions and supports healing.

Turmeric (*Curcuma longa*) is a rhizomatous herb belonging to the family Zingiberaceae. The dried rhizomes are widely used as a spice as well as in traditional medicine. Curcumin is one of the major biologically active constituents of turmeric and is associated with antioxidant and anti-inflammatory activities. Turmeric has traditionally been used for wound healing, inflammation, and various skin-related conditions. In an anti-acne patch, turmeric extract may help reduce redness and inflammation associated with pimples and support the healing of acne lesions. Its antioxidant activity may also help reduce oxidative stress in the skin. However, formulation studies are important because concentrated turmeric extracts may cause staining or irritation in some individuals ^[51].



Fig 9: Turmeric

5. Witch Hazel

Scientific name: *Hamamelis virginiana* L.

General Name: Witch hazel

Biological Name: Dried leaves and bark of *Hamamelis virginiana*

Major Uses: Astringent, anti-inflammatory, antioxidant, skin-soothing.

Role in anti-acne patches: Its astringent and anti-inflammatory properties can help reduce excess oil, redness and irritation around acne ^[52].

Witch hazel (*Hamamelis virginiana*) is a medicinal shrub belonging to the family Hamamelidaceae. The leaves and bark are commonly used to prepare herbal extracts containing tannins and other phenolic constituents. Witch hazel is traditionally recognised for its astringent and soothing properties and is commonly incorporated into topical skin preparations. Its astringent action may help reduce excessive surface oil and provide a cleansing effect, while its anti-inflammatory properties may help reduce skin

redness and irritation. In anti-acne patches, witch hazel extract may be useful for acne-prone and oily skin. Its inclusion may contribute to a cleaner and less oily environment around the acne lesion ^[52].



Fig 10: Witch Hazel

6. Calendula

Scientific Name: *Calendula officinalis* L.

General Name: Calendula / Marigold

Biological Source: Dried flower heads of *Calendula officinalis*

Major Uses: Anti-inflammatory, wound healing, antimicrobial, soothing

Role in anti-acne patches: Helps reduce inflammation and irritation and promotes healing of acne-affected skin.

Calendula (*Calendula officinalis*), commonly known as marigold, belongs to the family Asteraceae. The dried flower heads are the commonly used medicinal part of the plant. Calendula contains flavonoids, triterpenoids, carotenoids, and other phytochemicals that are associated with antioxidant, anti-inflammatory, and skin-soothing properties. It has traditionally been used in topical preparations for minor skin irritation and wound care. In anti-acne patches, calendula may help calm inflamed and irritated skin and support the natural repair of acne lesions. Its soothing properties can also improve the comfort of a patch applied directly over a pimple ^[53].



Fig 11: Calendula

7. Liquorice

Scientific Name: *Glycyrrhiza glabra* L.

General Name: Liquorice / Yashtimadhu

Biological Source: Dried roots and stolons of *Glycyrrhiza glabra*.

Major Uses: Anti-inflammatory, antioxidant, skin soothing, depigmenting.

Role in Anti-acne patch: Helps calm inflamed acne, while compounds such as glabridin may help reduce post-acne pigmentation.

Liquorice (*Glycyrrhiza glabra*) is a medicinal plant belonging to the family Fabaceae. The dried roots and stolons are the main medicinal parts used in herbal preparations. Glycyrrhizin, flavonoids, glabridin, and other phytoconstituents are present in liquorice and contribute to its pharmacological properties. Liquorice is traditionally used for its soothing and anti-inflammatory effects and has also been investigated for its potential effects on skin pigmentation. In anti-acne patches, liquorice extract may help calm inflammation associated with acne and support improvement in the appearance of post-acne discolouration. Therefore, it may be particularly useful in polyherbal patches intended not only to manage active acne but also to support the appearance of acne-prone skin ^[53].



Fig 12: Liquorice

8. Green Tea

Scientific Name: *Camellia sinensis* L. Kuntze

General Name: Green tea

Biological Source: Young, non-fermented leaves and leaf buds of *Camellia sinensis*

Major Uses: Antioxidant, anti-inflammatory, antimicrobial, astringent.

Role in anti-acne patches: Helps to reduce sebum-related acne, inflammation and oxidative stress; useful for oily and acne-prone skin.

Green tea is obtained from the young, non-fermented leaves and leaf buds of *Camellia sinensis*, belonging to the family Theaceae. Green tea is rich in polyphenolic compounds, particularly catechins such as epigallocatechin gallate (EGCG). These compounds are associated with antioxidant and anti-inflammatory activities. Green tea has attracted interest in cosmetic and dermatological preparations because of its potential effects on oily and acne-prone skin. In anti-acne patches, green tea extract may help reduce inflammation and oxidative stress and may contribute to controlling excess sebum. Its antioxidant activity can also support the protection of skin cells from oxidative damage ^[54].



Fig 13: Green Tea

9. Tulasi

Scientific Name: *Ocimum Tenuiflorum* L.

General Name: Tulasi /holy basil

Biological Source: Leaves and aerial parts of *ocimum tenuiflorum*

Major uses: Antimicrobial, anti-inflammatory, antioxidant

Role in anti-acne patch: May help to inhibit microbial growth and reduce inflammation associated with acne lesions.

Tulasi or holy basil (*Ocimum tenuiflorum*) is a medicinal herb belonging to the family Lamiaceae. The leaves and aerial parts are commonly used in traditional herbal preparations. Tulasi contains various phytoconstituents, including essential oils, phenolic compounds, and flavonoids, which are associated with antimicrobial and antioxidant activities. Traditionally, tulasi has been used in preparations intended for skin cleansing and management of minor skin problems. In anti-acne patches, tulasi extract may help reduce microbial activity and inflammation around acne lesions. Its antioxidant properties may additionally support the skin against oxidative stress, making it a useful component of a polyherbal anti-acne formulation ^[54].



Fig 14: Tulasi

10. Manjistha

Scientific Name: *Rubia cordifolia* L.

General Name: Manjistha/Indian madder.

Biological Source: Dried roots and rhizomes of *Rubia cordifolia*

Major Uses: Anti-inflammatory, Antioxidant, antimicrobial; traditionally used for skin disorders

Role of Anti_acne patch: Can help to reduce inflammation and microbial activity and is traditionally used to support healthy skin and reduce blemish-related discolouration.

Manjistha (*Rubia cordifolia*), commonly known as Indian madder, is a medicinal plant belonging to the family Rubiaceae. The roots and rhizomes are traditionally used in herbal medicine. The plant contains various phytoconstituents, including anthraquinone derivatives, which are associated with several biological activities. Manjistha has traditionally been used in Ayurvedic preparations for maintaining healthy skin and for various inflammatory and skin-related conditions. In anti-acne patches, Manjistha extract may contribute to reducing inflammation and supporting healthy skin. It may also be useful in formulations intended to improve the appearance of blemishes and post-acne marks. Further formulation and clinical studies are required to establish its specific effectiveness in patch systems^[55].



Fig 15: Manjistha

Conclusion

Herbal pimple and acne patches are an emerging approach to acne management that combines the therapeutic properties of medicinal plants with modern patch technology. Acne is a common skin condition associated with excess sebum production, follicular blockage, microbial activity, and inflammation. Conventional treatments are effective in many cases, but they may sometimes cause skin irritation, dryness, or other unwanted effects. Herbal acne patches provide a convenient and localised method of applying active ingredients directly to acne-affected areas. This review highlights the potential use of herbal ingredients such as tea tree, aloe vera, neem, turmeric, witch hazel, calendula, green tea, liquorice, tulasi, and manjistha in polyherbal anti-acne patches. These ingredients possess reported antimicrobial, anti-inflammatory, antioxidant, soothing, and skin-supporting properties, which may help reduce acne-related inflammation and support the natural healing process. The use of hydrocolloid or medicated patch systems may also protect acne lesions from dust, external contamination, and repeated touching. Polyherbal formulations provide an opportunity to combine different herbal ingredients and their complementary activities in a single preparation. However, the effectiveness of herbal acne patches depends on the selection of suitable ingredients, appropriate concentrations,

extraction methods, polymer compatibility, adhesion, drug release, and formulation stability. Safety evaluation is also important because certain herbal ingredients, particularly essential oils, may cause skin irritation or allergic reactions in sensitive individuals. Therefore, further pharmaceutical research is required to optimise the formulation and evaluate its physical properties, antimicrobial activity, anti-inflammatory effects, skin compatibility, stability, and clinical performance. Proper quality control and scientific validation are necessary to ensure the safety, effectiveness, and consistency of the final product. In conclusion, polyherbal anti-acne patches may serve as a useful complementary option for localised acne care. Their convenient application, prolonged contact with the skin, and potential herbal benefits make them a promising area for further research and development in pharmaceutical and cosmetic formulations.

Reference

1. Zaenglein AL, Pathy AL, Schlosser BJ, *et al.* Guidelines of care for the management of acne vulgaris. *J Am Acad Dermatol*,2016;74(5):945-973.
2. Williams HC, Dellavalle RP, Garner S. Acne vulgaris. *Lancet*,2012;379:361-372.
3. Kurokawa I, Danby FW, Ju Q, *et al.* New developments in acne pathogenesis and treatment. *Exp Dermatol*,2009;18:821-832.
4. Dréno B. What is new in the pathophysiology of acne. *J Eur Acad Dermatol Venereol*,2017;31(S5):8-12.
5. Bhate K, Williams HC. Epidemiology of acne vulgaris. *Br J Dermatol*,2013;168:474-485.
6. Cong TX, Hao D, Wen X, *et al.* From pathogenesis of acne vulgaris to anti-acne agents. *Arch Dermatol Res*,2019;311:337-349.
7. Zaenglein AL. Acne vulgaris. *N Engl J M*,2018;379:1343-1352.
8. Nast A, Dréno B, Bettoli V, *et al.* European evidence-based guidelines for acne treatment. *J Eur Acad Dermatol Venereol*,2016;30:1261-1268.
9. Prausnitz MR, Langer R. Transdermal drug delivery. *Nat Biotechnol*,2008;26:1261-1268.
10. Barry BW. Novel mechanisms and devices for transdermal drug delivery. *Eur J Pharm Sci*,2001;14:101-114.
11. Williams AC, Barry BW. Penetration enhancers. *Adv Drug Deliv Rev*,2004;56:603-618.
12. Prausnitz MR, Mitragotri S, Langer R. Current status and future potential of transdermal drug delivery. *Nat Rev Drug Discov*,2004;3:115-124.
13. Boateng J, Catanzano O. Advanced therapeutic topical systems for skin diseases. *J Pharm Sci*,2015;104:365-380.
14. Tan X, Feldman SR, Chang J, Balkrishnan R. Topical drug delivery systems in dermatology. *Expert Opin Drug Deliv*,2012;9:685-703.
15. Boateng JS, Matthews KH, Stevens HNE, Eccleston GM. Wound healing dressings and drug delivery systems. *J Pharm Sci*,2008;97:2892-2923.
16. Dumville JC, Gray TA, Walter CJ, *et al.* Hydrocolloid dressings for wound healing. *Cochrane Database Syst Rev*, 2013.
17. Bassett IB, Pannowitz DL, Barnetson RSC. Tea-tree oil versus benzoyl peroxide in acne. *Med J Aust*,1990;153:455-458.

18. Enshaieh S, Jooya A, Siadat AH, Iraj F. Efficacy of topical tea tree oil gel in acne vulgaris. *Indian J Dermatol*,2007;73:22-25.
19. Carson CF, Hammer KA, Riley TV. *Melaleuca alternifolia* tea tree oil: a review. *Clin Microbiol Rev*,2006;19:50-62.
20. Bakkali F, Averbeck S, Averbeck D, Idaomar M. Biological effects of essential oils. *Food Chem Toxicol*,2008;46:446-475.
21. Surjushe A, Vasani R, Sable DG. Aloe vera: a short review. *Indian J Dermatol*,2008;53:163-166.
22. Hamman JH. Composition and applications of Aloe vera leaf gel. *Molecules*,2008;13:1599-1616.
23. Eshun K, He Q. Aloe vera: a valuable ingredient for pharmaceutical and cosmetic industries. *Crit Rev Food Sci Nutr*,2004;44:91-96.
24. Biswas K, Chattopadhyay I, Banerjee RK, Bandyopadhyay U. Biological activities of neem. *Curr Sci*,2002;82:1336-1345.
25. Subapriya R, Nagini S. Medicinal properties of neem leaves. *Curr Med Chem*,2005;5:149-156.
26. Hewlings SJ, Kalman DS. Curcumin: a review of its effects on human health. *Foods*,2017;6:92.
27. Vaughn AR, Branum A, Sivamani RK. Effects of turmeric on skin health. *Phytother Res*,2016;30:1243-1264.
28. Thring TSA, Hili P, Naughton DP. Antioxidant and anti-inflammatory activity of witch hazel extracts. *BMC Complement Altern Med*,2011;11:27.
29. European Medicines Agency. *Hamamelis virginiana* herbal medicinal product assessment report. EMA.
30. Preethi KC, Kuttan G, Kuttan R. Anti-inflammatory activity of *Calendula officinalis*. *Immunopharmacol Immunotoxicol*,2009;31:155-161.
31. Pastorino G, Cornara L, Soares S, Rodrigues F, Oliveira MBPP. Liquorice and its bioactive compounds. *Phytother Res*,2018;32:2323-2339.
32. Katiyar SK, Elmets CA. Green tea and skin. *Arch Dermatol*,2001;137:855-862.
33. Cabrera C, Artacho R, Giménez R. Beneficial effects of green tea. *J Am Coll Nutr*,2006;L25:79-99.
34. Pattanayak P, Behera P, Das D, Panda SK. Ocimum sanctum: therapeutic applications. *Indian J Tradit Knowl*,2010;9:1-8.
35. Kaur R, Kaur H, Dhindsa AS. *Glycyrrhiza glabra*: phytochemical and pharmacological review. *Int J Pharm Sci Res*,2013;4:2470-2477.
36. Srivastava S, Rawat AKS, Singh CN. *Rubia cordifolia*: phytochemical and pharmacological review. *Pharmacogn Rev*,2011;5:72-80.
37. Aulton ME, Taylor K. Aulton's Pharmaceuticals: The Design and Manufacture of Medicines. Elsevier, 2018.
38. Allen LV, Ansel HC. Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems. Wolters Kluwer, 2014.
39. Lodén M. The clinical benefit of moisturizers. *J Eur Acad Dermatol Venereol*,2005;19:672-688.
40. Sundaram H, Mehta RC, Norine JA, *et al.* Hydrocolloid dressings and wound healing. *Adv Wound Care*,2014;3:1-10.
41. Korting HC, Schöllmann C. Antimicrobial peptides and acne vulgaris. *Skin Pharmacol Physiol*,2010;23:1-8.
42. World Health Organization. Quality control methods for herbal materials. WHO, 2011.
43. World Health Organization. Good herbal processing practices for herbal medicines. WHO, 2018.
44. ICH. Q1A(R2): Stability Testing of New Drug Substances and Products.
45. ICH. Q8(R2): Pharmaceutical Development.
46. ICH. Q9: Quality Risk Management.
47. U S. Food and Drug Administration. Guidance for Industry: Transdermal and Topical Delivery Systems.
48. Draeos ZD. Cosmetic dermatology: products and procedures. Wiley-Blackwell, 2015.
49. Guy RH. Current status and future prospects of transdermal drug delivery. *Pharm Res*,1996;13:1765-1770.
50. Boateng J, *et al.* Topical systems for localised dermatological delivery. *J Pharm Sci*.
51. World Health Organization. WHO guidelines on herbal medicine quality and safety.
52. International Council for Harmonisation. Quality risk and stability considerations in pharmaceutical development.
53. European dermatology guidance on acne management.
54. Review literature on herbal topical formulations and skin compatibility.
55. Review literature on polyherbal formulation development and evaluation.