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Herbal Products for Acne Vulgaris: A Review

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ABSTRACT

Acne is a prevalent skin condition that affects a considerable portion of the population, primarily teenagers and young adults. In most cases, it causes pimples on the face, neck, and upper back. A variety of red and flaky skin patches, as well as blackheads, whiteheads, nodules, and pustules, characterize this condition. Acne has a significant cutaneous and psychological illness burden, and its pathophysiology and current therapies are challenging. The severity of acne varies, and some people are more likely to get it because of their genes. Acne inflammation has been linked to the pus-forming bacteria Propionibacterium acnes (P. acne). In the past century, many treatment options have been available in the market that could be taken in oral or topical treatment options. Plant extracts that are useful in treating acne have recently gained popularity as a natural acne treatment alternative.

This article aims to discover how antibacterial herbal medicines work against the things that cause acne vulgaris. Pathogenic reasons are high sebum production, pilosebaceous duct calcification, dysbiosis, and inflammation. As part of the treatment, synthetic drugs with significant side effects must be taken continuously throughout the year. Because of this, the safest, most effective medications are needed for therapy. Medications made from plant extracts, such as herbal ones, are a safe alternative to synthetic drugs. The herbal plants in this article are research-based, using active components of the plants that have anti-inflammatory, antibacterial properties and reduce sebum production to help treat or alleviate acne. Hence, herbal therapy aims to give people access to safe, effective, and cost-effective medicines. The current review summarizes different herbal products' roles in treating acne, where many databases were gathered and searched to find every medicinal plant with anti-acne action and provide effective treatment options for individuals who opt to consider herbal medication for acne

Keywords: Acne, Acne vulgaris, Antibacterial, Antimicrobial, Anti-inflammatory , Propionibacterium acne (P. acnes), herbal medicine

Introduction

Acne vulgaris is an inflammatory disease that commonly affects a lot of people. It is said to affect about 85% of the human population at some point in their lives [1]. Some studies have further searched into the age range that is more commonly affected. The age range of 12-25 years of age was then identified [2].This skin disease occurs when the skin cells which have departed block the hair follicles. The mortality rates linked with the disease are low; however, having acne vulgaris is considered to be a big health problem as it also has psychological effects [1].

Acne is said to have a high psychological impact on a person [2]. As acne is most of the time present in the face of people, it leads to issues regarding body image and socialization. It is quite known that adolescents are regularly concerned about how they look [3]. People with acne are said to have anxiety and experience being devalued, stressed, feel fear, social phobia disorder, and have a personality classified as type D, and even reduced employment opportunities. The stress that is identified on those who have acne may also lead to dermatillomania which would lead to more inflammations, scars, uneven skin tones, and body image dissatisfaction [2].And, this skin problem is common to both men and women during their puberty stage [2]. In terms of experiencing low self-esteem, a study conducted in 2020 among Egyptian adolescents states that the feeling of low self-esteem commonly occurs more in women compared to men [3].

But how does acne develop? On the stratum corneum which is the outermost skin layer, keratin is present. When there is already excessive keratin production, it results in the dead skin cells sticking together. These dead skin cells would then mix with the oil from the sebaceous gland which results in a blockage in the hair follicle. This blockage is what begins the production of acne [4].

Moreover, when a person experiences acne, the hair, keratinocytes, and sebum which all line the pilosebaceous unit would form a seal which prevents the sebum from flowing to the surface [5]. The overproduction of sebum leads to the canals being blocked and results in pimples. With the canals being blocked, the result is an overgrowth of the bacteria *Propionibacterium acnes* (*P. acnes*) for acne. The said bacteria releases enzymes that break the sebum which then leads to inflammation [6].

There are four primary factors that are responsible for the development of acne lesions. These primary factors are inflammation, the increase in the production of sebum, shedding of the keratinocytes, and the growth of bacteria [7]. The bacterium that is recognized as the primary source of the development of acne vulgaris is the *Propionibacterium acnes* (*P. acnes*). It is identified to be an anaerobic bacterium that is also gram-positive.It could also have propenoic acid as its metabolic by-product [1].

Herbal medicines have an increasing popularity as they have certain advantages such as better pain tolerance, lesser side effects, and relatively being less expensive. Moreover, these plants have been proven to help treat various diseases. With this, botanical drugs are also used to treat acne vulgaris [8].

In this review, besides discussing the types, causes, and classifications of acne, it would also talk about the different medications used to treat or prevent it. Moreover, we would focus on the different plants that are identified to have abilities to help treat or prevent acne vulgaris. Also, some formulations that these plants are made into and what products of such formulations are available in the market.

2. Methods

Acne Vulgaris is treated with a variety of herbal remedies, each of which is described in this section. This article review utilizes the different journal databases such as Google Scholar, Research Gate, PubMed, and Springer Open in order to gather and learn more information about the various herbal products and the way the plant works to treat the Acne Vulgaris.

2.1. Types of Acne

Acne vulgaris can manifest as different types. These are blackheads, whiteheads, pustules, papules, nodules, cysts, and maculae. These types of acne will be further elaborated below.

Acne lesions are the outer part of comedones and are formed as small patches on the skin [9]. These are generally classified as blackheads or whiteheads depending whether the pore is open or not.

Blackheads are pore obstructions caused by sebum and keratin that eventually turn the skin's surface black [9]. Also, Blackheads can be defined as a dilated hair follicle with a broad opening to the skin with keratin, sebum, and germs inside, and a dark mass of skin detritus covering the entrance [10]. It is also known as the "black spot" [11]. The oxidation of lipids within the blackhead accumulation of the cells and melanin gives it its dark color [11]. Whiteheads, on the other hand, are closed pores that are loaded with sebaceous gland secretions.This causes the tissue beneath to expand [9]. Whiteheads can also be defined as a keratin, sebum, and bacterial-filled dilated hair follicle with a blocked skin entry [10].

Fig. 1 - Blackheads vs. Whiteheads [15]

Pustules are tiny skin lesions filled with pus. Typically, pus is made up of a combination of leukocytes, bacteria, and dead skin cells. [9]. Additionally, pustules are defined with a smaller hump with an apparent purulent core at the center [10].

Fig. 2 - Pustule. [16]

Another form of acne that resembles pustules is called papules, but it differs from pustules in that it is a tiny, typically inflammatory lesion on the skin without pus [9]. Papules and Pustules may grow to up to 5mm in size with a raised region of erythmia [11]. However, papules are generally smaller than pustules with a usual diameter of less than 5 mm only [10]. Papules and Pustules are also differentiated by the fact that papules are formed when the inflammation is severe while pustules are formed when inflammation, erythema, and edema are present [11].

Fig. 3 - Papule [17]

Nodules are solid skin lesions that spread into the deeper layers of the skin, causing tissue damage and discomfort for the patient [9]. Nodules also leave scars on the skin and are painful to remove [9]. These are considered as a severe form of acne. Additionally, nodular acne is also identified through their diameter which should be greater than 5mm [10]. Nodular acne is also characterized with widespread development of inflammation throughout the skin [11]. Nodular acne can also eventually spread to cover the entire face, the chest, and the back [13]. These lesions can sometimes combine to form sinus tracts, and in their most severe form, acne conglobata, which affects the entire face, can occur [13].

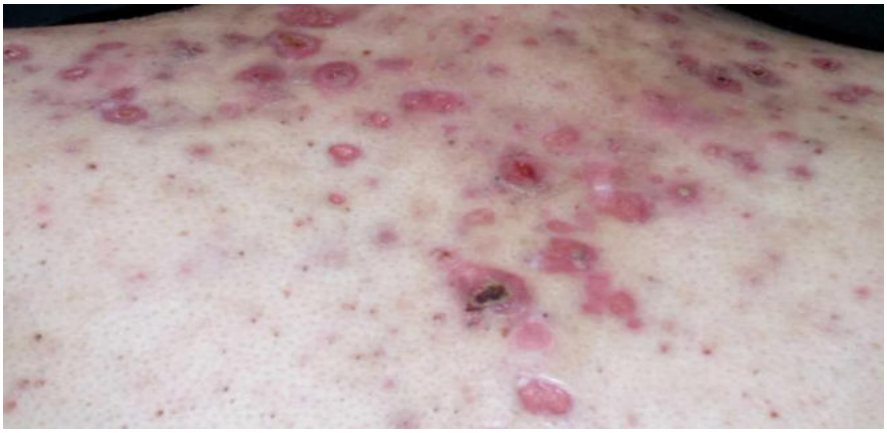

Fig. 4 - Nodules [18]

Cysts are a type of acne that have a capsule shape and are filled with pus comparable to pustules but cysts are larger than pustules and are more likely to become infected [9].Since cysts expand into the deeper layers of the skin and often leave scars in their wake, they are comparable to nodules in this regard [9]. Nodules and Cysts are generally larger than Pustules and Papules and can often last for several weeks [9].

Fig. 5 - Cysts [19]

Maculae are red spots that appear on the skin after an acne lesion has healed. These levels, when gathered collectively, give the face an irritated expression [9]. These are generally the resolving stage of an acne lesion which are seen as an area of eythmia [12]

Fig. 6 - Maculae [20]

2.2 Causes of Acne

Acne, being a prevalently universal skin condition, affects most individuals especially those who are of adolescence. Furthermore, the causes of acne may differ depending on the situation of each person [14].

2.2.1 Infection

The *Propionibacterium acnes*, formerly recognized as *Corynebacterium parvum*, is a gram-positive skin commensal anaerobic bacilli that is linked to the pathogenesis of acne [22]. When hair follicles are clogged, the combination of oil and cells present in the blocked follicle will stimulate the growth of *P. acnes* which further amplifies the actions of leukocytes. As a result, a pus-filled skin inflammation is produced [9]. In spite of this, studies have speculated the bacteria *P. acnes*' role in the formation of acne. Laboratory tests show that the amount of *P. acnes* present in patients with skin acne and those without acne are the same. Patients that have a severe case of acne also do not showcase an increased amount of *P. acnes* present on their skin compared to moderate and light cases of acne [14].

2.2.2 Hormonal Changes

During adolescence, both male and female teens begin to experience puberty. Females will also start to encounter menstrual cycles during this stage of life. These life events cause an increase in hormonal changes such as the elevated production of sebum in the follicular glands which is a factor to the formation of acne [9]. A number of actions by enzymes that can be found within the pilosebaceous unit result in the development of a dominant acne inducing hormone which is the Dihydrotestosterone. This is an endogenous androgen that is already present in both men and women [22] 1. Prior to the onset of puberty, adrenarche is occurring where two androgens are secreted by the adrenal cortex, namely the dehydroepiandrosterone and the dehydroepiandrosterone sulfate. Adrenarche is the event during the early childhood stage where there is an increase in the production of adrenal androgen due to the maturation of the child [23]. The onset of puberty will be caused by the presence of high amounts of gonadotropin-releasing hormone pulses, which stops the adrenarche [24]. Over the course of puberty, the testosterone precursors that are developed from the male testes, the ovaries of females, and the adrenal glands of both sexes can be converted by the native enzymes that are found in the pilosebaceous glands into dihydrotestosterone through a stepwise reaction. Subsequently, the dihydrotestosterone has now the capacity to bind to and activate its intranuclear receptor, which eventually leads to the development of acne [25].

2.2.3 Genetics

Cytochrome p450 genes, human leukocyte antigen genes, and some particular glycoproteins are inferred to have an association to the genetic susceptibility to acne vulgaris where studies have cited late adolescent acne individuals have one first-degree relative, at the least, to have this condition [26]. Patients suffering from a rare recessive disease called the Laron syndrome have been documented to have never experienced acne vulgaris due to their body's inadequately producing Insulin-like growth factor 1 (IGF-1) [27]. On the contrary, an excessive production of androgen caused by the overactivation of the phenotype IGF-1 results to a more severe rate of morbidity from acne vulgaris, which is more frequently observed in obese and insuling-resistant patients [28].

2.2.4 Diet

Researchers of a case-control study that was conducted to determine the predictive factors of acne concluded that young adults and adolescents with an elevated body mass index is a predictive factor to an elevated possibility for them to develop moderate to severe acne vulgaris [29]. A population-based study also concluded that young girls within the age of 18 and 19 years old are also reported to have a stronger association of being obese or overweight with an increased risk of having acne [30].

A diet that includes high-fat dairy products, high protein, high amounts of sugary desserts, high-sugar drinks, and refined grains are becoming more common in both developed and developing countries [31]. These types of food are prevalent in fast food restaurants and are more affordable which makes it a favorite among teenagers. This results in the rising rates of acne among young adults and adolescents [32]. In contrast, populations who do not follow or partake in these types of food generally do not exhibit acne vulgaris [33].

2.2.5 Psychological causes

Evidence is strengthening the relationship between psychological stress, and even intense anger, and them being an important cause in acne pathogenesis. The activities in the pilosebaceous unit can be altered by the increased production of inflammatory cytokines and hormones brought by emotional stress and anger. This results in the exacerbation of acne. A general trend among patients who were interviewed was observed wherein two days after experiencing extreme stress, acne is starting to show up [34]. 80-82% of patient participants of two epidemiological studies conducted in South Korea were reported to have psychological stress as the main trigger in the development of acne [35]. Escalated stress levels were significantly linked with examination season which contributed to the increase of acne severity among students of a university that was conducted in a prospective cohort study [36].

2.3 Classification and description:

Acne is categorized according to the severity of its signs. For primary acne vulgaris, the American Academy of Dermatology devised a classification system. There are three classifications of acne on this scale: mild, moderate, and severe. Mild acne is defined by a few to several papules and pustules but no nodules. Moderate acne patients have several papules and pustules, as well as a few to several nodules. Patients with severe acne have a lot of

papules and pustules, as well as a lot of nodules. Acne are also categorized based on the type of lesion they present such as comedonal, papulopustular, and nodulocystic. Pustules and cysts are considered inflammatory acne [37].

Acne is a common skin problem in which hair, sebum (an oily component), bacteria, and dead skin cells clog your pores. Blackheads, whiteheads, nodules, and other forms of pimples are the result of these blockages [38].

The face, forehead, chest, shoulders, and upper back are the most typical areas where acne can appear. Oil glands may be found all throughout your body, but they are clustered in particular areas. The best technique to treat acne is determined by its severity [39]. Moreover, the bumps and pimples dissipate gradually, and as one begins to disappear, other ones develop. Acne can cause mental anguish and skin scarring [38].

2.4 Herbal products for acne vulgaris:

2.4.1 Azadirachtaindica Linn

Azadirachtaindica Linn is also called as Neem. It is a plant that is already well studied and has antibacterial effects and is proven to combat acne. With this, various formulations are designed with A. indica as one of the ingredients in order to treat acne or to prevent it from happening.

Neem is a medicinal plant that is found to have antibacterial effects against *P.acnes*(Acne causing bacteria). An in-vitro study was conducted in 2011 and it showed that the plant's aqueous, ethanolic, and petroleum ether extracts have shown to have antibacterial effects [40].

Another study conducted was able to identify that A. indica has the ability to suppress the ability of *P. acnes* to induce ROS and its proinflammatory cytokines. It is said that A. indica oil was able to demonstrate the antibacterial effects of the medicinal plants. This was shown in an in vitro test wherein the bacterial membrane synthesis was inhibited. A. indica contained five phytochemicals that helped against *P.acnes* and these were the antibacterials, nimboid, gedunin, mahmoodin, and margalone. Also with the antifungal cyclic trisulphide [41].

The "Himalaya Purifying Neem face wash." is a facial wash that is already out in the market which claims to prevent acne. From the name itself it can already be seen that the product uses A indica (Neem) to prevent acne from occuring [42]. There are also formulations that are designed to treat acne.

The "Sang-pure tablets" are labeled for the treatment of acne and pigmentation. A box of this medication would contain 30 tablets and come in a bright red color [43].

2.4.2 Betula alba Linn

The *Betula alba Linn* is also the Downy birch is a medicinal plant that is backed up by research to be good for acne-prone skin. With this, there are numerous formulations created that include Downy birch as of their ingredients. The "Betula Tar" is a cleansing flake formulated with Downy Birch as one of its ingredients. This product is said to be for people who have oily skin, sensitive skin, and those who are prone to acne [44]. "Sol Acne" is a product line that offers a wash gel and cream which is part of their anti acne protection set. The product has Downy birch as one of its ingredients to help in treating acne. The product line claims to be able to clear up acne and prevent its reappearance. Moreover, the product feels lightweight and is suitable for all skin types [45].

The Downy birch is said to have antibacterial and anti-inflammatory effects.In a research conducted in 2012, that aimed to see what plants rich in flavonoids would be a good ingredient for a new formulation for acne-prone skin, the Downy birch,was identified to be one of the good plants to use. The plant is recommended to be added in cosmetics at concentration 1-5% [46].

2.4.3 Carica papaya Linn

Papaya is quite good for the culinary and nutritional qualities all over the world. The ancient system of medicine is also well aware of the therapeutic benefits of papaya fruit and other plant components. The biological activity and medical uses of papaya have advanced significantly over the past few decades, and it is currently regarded as a useful fruit plant for nutritional supplements [47,48].

Antibacterial activity of *Carica papaya* has been widely carried out including Staphylococcus aureus, Bacillus cereus, and more [49,50]. Treatment for acne-related problems is among the benefits. According to one of the studies, Its purpose was to create a gel out of papaya leaf extract and assess its effectiveness against Propionibacterium acnes. According to the study's findings, bacterial growth is inhibited by active papaya leaf ethanol extract gel at concentrations of between 10 and 15 percent [51].

A formulation that contains a Carica papaya is the Silka Green Papaya Complexion Fairness and Anti Acne Soap. This product brightens the skin, uniformly whitens the skin, and boosts hydration. Additionally, it minimizes pores, acne, and oiliness [52].

2.4.4 Cinnamomumcamphora Linn

Cinnamomumcamphora, referred to as camphor tree or camphor laurel, is a herb with anti-inflammatory and antibacterial properties [53,54]. One of the products in the market that is safe for topical application is camphor essential oil; when applied topically, camphor essential oil's cooling properties alleviate redness, blisters, bug bites, itching, irritation, rashes, and acne [55]. A well-known product containing Cinnamomumcamphora (Linn.) is Avnii Organics Pure Natural Camphor Essential Oil, used to treat acne as well as dandruff and skin irritation [56].

In traditional Chinese medicine, camphor tree essential oil (EO) is commonly used to treat inflammation, rheumatic diseases, and muscle strains [57]. Research indicates that Cinnamomumcamphora possesses various biological properties, including anti-inflammatory, antibacterial, and antioxidant properties. [54]. Consequently, Camphor can treat acne and it is intended to reduce the discomfort and swelling caused by inflammation of the hair follicle and sebaceous gland. The antibacterial activity of camphor's bioactive components, such as 1,8-cineole, α-pinene, and camphene, aids in the treatment of acne [58].

2.4.5 Citrus aurantium Linn

The *Citrus aurantium Linn* is a plant grown in tropical climates and is often used in traditional medicines such as in Nigeria. The common ailments that are treated using this plant are the common cold, alcoholism, stomachache, and acne. This plant is commonly called the bitter orange or lime [59]. High amounts of limonin, vitamin C, and other bioactive compounds are observed to be the major role players in inhibiting acne-producing bacteria, the *Staphylococcus epidermidis* [60].

Examples of products containing *Citrus aurantium Linn* are the Aēsop Bitter Orange Astringent Toner, Primavera Neroli Oil, and Whamisa Organic Flowers Peeling Finger Mitt [61,62]. Adding honey and palm oil to its mesocarp greatly adds to the effect of preventing acne when scrubbed onto the face [63].

2.4.6 Cocus nucifera Linn

The main ingredients of the versatile plant *Cocus nucifera Linn*, which has not received much investigation as a medication or cosmetic, are water and soft flesh. Moreover, the lauric acid in*Cocus nucifera Linn*., which has antibacterial properties against Propionibacterium acnes, is reported to lessen the severity of pimples. The current study looked at the optimum emulgel mask formulation based on *Cocus nucifera Linn*, coconut extract. The extract demonstrated antibacterial activity against P. acnes at doses of 1 and 5% and was successfully converted into a peel-off mask recipe using the gelling ingredient carbomer 940 [64].

Products made from *Cocus nucifera* include Cocokind Facial Repair Oil, which may be used to lighten dark spots and give the face a more even tone. Moreover, Sports Research carries this coconut oil for those with dry and damaged skin [65].

2.4.7 Cucurbito pepo Linn

Pumpkin, scientifically known as*Cucurbito pepo Linn,* is a member of the Cucurbitaceae family. Oleic acid, linoleic acid, and cucurbitacins B, D, E, and G are the active components of these plants. The parts utilized for this plant include fruit and flower, where the juices are administered in the topical area that has been exposed to the microbe [66].

Based on the content of pumpkin seed oil, its topical anti-inflammatory activities have been studied. Unsaturated fatty acids, that have already been proposed as possible anti-inflammatory drugs in treating a number of inflammatory skin conditions, can alter inflammation through a variety of methods. Against both acute and persistent skin inflammatory processes, pumpkin seed oil functions as a topical anti-inflammatory agent. This study provides proof that using pumpkin seed oil to treat inflammatory facial acne is both safe and effective. The pumpkin seed oil's boiling and melting points result in a feature used in the production of cold cream [67].

MBK Clinical Skincare Solutions Pumpkin Cleanse is an example of a formulation containing *Cucurbito pepo Linn,* where this protects the skin from damage while refreshing the skin and removing surface residue [68].

2.4.8 Curcuma longa Linn

The *Cucurma longa Linnn*, also known as Turmeric, is a medicinal plant that is backed up research to be a good ingredient for formulations for the treatment or prevention of acne. With this, there are formulations made by people which include Turmeric as an ingredient of their products for those with acne.

Turmeric is said to have antimicrobial and anti-inflammatory properties. This claim is already widely supported by numerous researchers which tested it against *P. acnes.* A study conducted in 2015 tested out turmeric against the acne-producing bacteria. This study said that Turmeric has effective antibacterial activities [69]. Another research conducted in 2016 has shown that Turmeric is a good treatment for acne. This study involved a group of subjects to use Turmeric tablets together with other turmeric formulations or placebos. In the end, those who took the Turmeric tablets together with Turmeric topical cream were considered to have the best improvements. when based on the Leed's Technique which is an all-around technique for acne grading [70].

Turmeric has good anti-inflammatory effects for the reason that it is able to inhibit numerous different molecules that involve inflammation. These molecules would include the COX-2, leukotrienes, lipooxygenase, phospholipase, prostaglandins, thromboxane, and more [71].

The "Sincemeet Turmeric soap" is a product that utilizes Turmeric as an ingredient to help treat acne. It is used for both the face and body. The bar soap itself shows that it truly is formulated with Turmeric as the soap has a yellow-orange color. Moreover, it is said to smell like Turmeric as well [72]. The "Turmeric Facial Cream" is also another product in the market that has Tumeric as one of its ingredients. It uses Turmeric for its claims of brightening and anti-acne effects. The box of the product is also colored orange, symbolizing that it truly uses Turmeric [73].

2.4.9 Eucalyptus globulus Linn

The *Eucalyptus globulus Linn*, more commonly known as Eucalyptus, is a medicinal plant that studies support to have effects in helping skin with acne. The product "Aura Decor Eucalyptus Essential Oil" includes Eucalyptus as one of its ingredients in order to help protect the skin from acne. It can be applied to the hair, skin, and face. The product claims that it has 100% pure essential oil extract. Besides being directly applied on the body, it can also be mixed with other cosmetic products [74].

The Eucalyptus is said to have antibacterial properties. There was a study conducted in 2004 that tested 26 different species of eucalyptus leaves which included the *Eucalyptus globulus.* The findings of the study showed that the plant has significant antimicrobial activities against numerous gram-positive bacteria which includes *P.acnes*. The reason for the said significant antimicrobial activity was because of three flavonoids present in the plant [75].

Another study conducted in 2008 which aimed at developing an anti-acne cream also said that the Eucalyptus essential oil has antibacterial effects against numerous bacteria which included *P. acnes.* Moreover, the study also said that the monoterpene Gamma-terpinene is the one that plays the major role for the antibacterial property [76].

The product "Precious Eucalyptus Soap" is a bar soap that uses Eucalyptus as one of its ingredients for acne prevention. The product claims to have anti-bacterial and anti-inflammatory effects which help in the prevention of acne from occuring. The bar soap comes in a whte color and weighs 90 grams [77].

2.4.10 Glycyrrhiza glabra Linn

Glycyrrhiza glabra Linn, often known as licorice, is a traditional medicinal plant documented worldwide for its ethnopharmacological significance and studies that support its anti-inflammatory suitability for acne treatment. [78].

According to a 2003 study, licorice substantially decreased the chemotactic impact of *Propionibacterium acnes* (*P. acnes*). As part of its antibacterial properties, the plant displayed antibacterial activity against two laboratory-tested P. acnes strains. Glycyrrhiza glabra, in conjunction with other anti-acne herbs and a suitable keratolytic agent, may be beneficial for preventing and treating acne [79]. This plant's anti-inflammatory properties are also a crucial factor in its ability to alleviate psoriasis symptoms [80].

A popular product in the market is Skin Inc. Licorice Serum which is applied directly to the face that contains antioxidant-rich licorice serum that will soothe irritated skin. The highly concentrated serum minimizes the appearance of aging, calms, and soothes troubled skin [81].

2.4.11 Hamamelis virginiana Linn

Hamamelis virginiana Linn, commonly known as witch hazel, is a native plant found in North America and is mainly used in skin care and cosmetic products; however, scientific research that supports its efficacy in alleviating acne is limited.[82]. Witch hazel is commonly used to treat different skin conditions, such as skin itching, irritation, and soreness which are common skin conditions; it can help regulate oil production. It is accessible as a distilled liquid, cream, and ointment without a prescription [83]. Dickinson's Original Witch Hazel Pore Perfecting Toner is one product on the market that contains witch hazel; it eliminates debris, balances oil, calms irritation, and refreshes your face to prevent acne breakouts [84].

The European Medicines Agency (EMA) studied using hamamelis hydroalcoholic leaf or bark extracts for treating circulatory and skin disorders [85]. The most abundant polyphenols found in H. Virginiana leaves, and bark are the hydrolyzable and condensed tannins (proanthocyanidins) with antioxidant and anti-inflammatory effects [86].

The mechanisms of hamamelis extracts' anti-inflammatory effects on the skin are poorly characterized. Plant distillates demonstrated inconsistent efficacy in treating dermatitis in human investigations described in the scientific literature. However, a pilot trial involving seven healthy people examined the efficacy of a semi-solid formulation (1 percent witch hazel procyanidins) on sodium lauryl sulfate-induced skin irritation [87].

2.4.12 Ocimum sanctum Linn

Holy basil, also known as Ocimum sanctum Linn, is a herb that may be found all across India and in Indigenous Ayurvedic medicine, its leaves, seeds, and roots have all been utilized [88]. This herb can be formulated into different formulations to aid in the control of acne. One type of formulation is in a powder type which can be mixed with other ingredients to form a paste that can be used on the face to provide its effects. One example of such powder is the *"Ocimum sanctum leaf powder"* by Banyan Botanicals [89]. Another way to use this herb is through its essential oil. As stated above, the essential oil of this herb displays great activity against acne. The *"Tulsi (Holy Basil) Oil"* by doTERRA is one of the examples of such products that can be bought in the market today [90].

Due to its anti-stress, antioxidant, hepatoprotective, immunomodulating, anti-inflammatory, antimicrobial, antiviral, fungicidal, antipyretic, antidiuretic, antidiabetic, antimalarial, and hypolipidemic characteristics, this herb has a wide range of medical applications. [88].

The essential of this herb in particular showed good activity as an antibacterial agent against acne, specifically at low dilutions [91]. Linolenic acid, which can suppress the cyclooxygenase and lipoxygenase pathways of the arachidonate metabolism and is assumed to be the origin of the herb's anti-inflammatory actions, is said to be present in the essential oil of this plant which is used for the treatment against acne vulgaris [92]. Another study that

compared the essential oils of different herbs and plants against acne control concluded that holy basil displayed high inhibition of 5-LOX which is very useful in controlling acne [93]. The study theorized that the high amounts of Eugenol in the essential oil of this herb contributed greatly to this activity [93]. A study from 2005 also concluded that the active constituent Eugenol found in this plant is largely responsible for the therapeutic potential of *Ocimum sanctum linn*[94].

Another study concluded that Ocimum sanctum Linn may include naturally occurring anti-inflammatory and antibacterial compounds that are excellent for topical usage in the pharmaceutical and cosmetic industries. [95].

This herb can be formulated into different formulations to aid in the control of acne. One type of formulation is in a powder type which can be mixed with other ingredients to form a paste that can be used on the face to provide its effects. One example of such powder is the Ocimum sanctum, leaf powder by Banyan Botanicals [89]. Another way to use this herb is through its essential oil. As stated above, the essential oil of this herb displays great activity against acne. The Tulsi (Holy Basil) Oil by doTERRA is one of the examples of such products that can be bought in the market today [90].

2.4.13 Plumbago zeylanica Linn

The plant *Plumbago zeylanica Linn,* often known as Chitrak, is a member of the Plumbaginaceae family and it is utilized in Indian traditional medicine. Plumbago zeylanica's various parts are utilized for diverse ethnomedicinal uses. Its antibacterial, antimycotic, antiviral, as well as its pharmacological effects, have been investigated [97]. Chitrak from Phyto Life Sciences is an example of a formulation that works as a skin-protecting agent to fend against skin diseases [96].

The aqueous extract and its partition eradicated Salmonella gallinarum, Escherichia coli, Proteus vulgaris, and more. Plumbago zeylanicaroot with its alcohol extract was tested for clinical multidrug resistance. The extract displayed high antibacterial action against all tested microorganisms [97].

The antibacterial activity of *Plumbago zeylanica Linn*'s leaf extract were evaluated on gram positive and gram negative bacteria, such as Staphylococcus aureus, Bacillus subtilis, and Escherichia coli and Pseudomonas aeruginosa. The phytochemical tests were conducted using the leaf samples. Alkaloids, glycosides, lignin, tannins, reducing sugars, simple phenolics, saponins, and flavonoids were discovered in the phytochemical examination and the presence of different secondary metabolites was responsible for the leaves' antibacterial properties [98].

Moreover, in another study, theThe root, seed, and bark of *Plumbago zeylanica*are employed in a variety of medicinal processes. For acne-prone skin or individuals struggling with chicken pox, the powder can be added to bath teas [99].

2.4.14 Pterocarpus santalinus Linn

Pterocarpus santalinus are some of the plants used for healing wounds [100]. *Pterocarpus santalinus*, often known as Red sanders in English, is a member of the family called Fabaceae [101]. It's an endangered species that is only found in Andhra Pradesh [101]. It is known for its distinctive wood, which has excellent color, beauty, and technical features, and is considered among Japan's greatest luxury [101]. *Pterocarpus santalinus* is present in the formulation named ENN Ac Ney Antiacne Face Mask [102].

a pharmacological investigation of its toxic effects and wound-healing capacity in animal tests was presented [100]. A petroleum jelly-based ointment was created using powder derived out from wood of the Pterocarpus santalinus tree and there are no toxic reactions noted throughout the course of 72 hours [100]. Wounds treated with the test ointment healed far more quickly, therefore, Pterocarpus santalinus is safe and effective for animal models [100].

Moreover, in using the previous study, they were using the ointment to 6 lower extremity wound patients and recorded [103]. Wound healing was observed when the ointment was tested [103]. Impacts on hematology metrics are provided to demonstrate the changes, but they cannot make meaningful inferences from these observations [103]. In another study, the stem bark extract of the plant was discovered to have broad-spectrum antibacterial properties against the organisms tested [101].

2.4.15 Rheum officinaleBaill

Rheum officinaleBaill, more known as the chinese rhubarb, is one of the well known, tried and tested, Chinese herbal medicine that is usually utilized as an effective treatment for cooling blood, purging accumulation, and even as a short-lived painless cathartic [104]. Skin care products for acne that contain *Rheum officinaleBaill* include Strawberry Rhubarb Hyaluronic Serum and Dermafoliant, both from the company Eminence Organic Skin Care [105].

A research was carried out in order to explore the antibacterial properties of the *Rheum officinaleBaill*'s ethanol extract and Rhein against the bacteria *Propionibacterium acnes*. Rhein is a cassic acid commonly found in rhubarbs and is usually in a form of glycosides. It is a laxative and an antibacterial agent. Rhizomes of the chinese rhubarb were collected to create the ethanol extract for the study's tests. The investigators then utilized numerous different methods and tests such as the Paper Disc Diffusion Method and more to measure the *Rheum officinaleBaill*'s ethanol extract's activity against the acne-causing bacteria *Propionibacterium acnes*. The tests gave promising results as the extracts proved to inhibit and exhibited activities against the bacteria wherein the Rhein content of the rhubarb was the main variable in the extracts antibacterial activity [106].

2.4.16 Ricinus communis Linn

Castor oil, also known as Ricinus communis Linn, is believed to have antioxidant, anti-implantation, anti-inflammatory, anti-diabetic, central analgesic, antitumor, larvicidal & adult emergence inhibition, antinociceptive, and antiasthmatic effects. [107]. Castor oil is used as one of the ingredients in a wide range of products that are now on the market to help treat Acne Vulgaris. One widely used castor oil item in today's market offers 100% pure cold-pressed castor oil, which may be applied straight to the skin or combined with other ingredients to create DIY face masks. *"BriogeoB.Well Organic Cold-Pressed 100% Castor Oil" is* one such item [108.]. Another item called "Cetaphil Derma Control Oil Removing Foam Wash for Oily and Sensitive Skin" is a face wash that incorporates castor oil as a means of treating and preventing acne on the face [109].

Its anti-inflammatory effects are its main incentive for acne. It was discovered in a 2012 study that this plant has wound-healing capabilities because of the active components of castor oil, which has antioxidant activity and strengthen collagen fibers to improve circulation and the vitality of collagen fibrils, which prevents cell damage by boosting DNA synthesis and collagen fiber strength [110]. Ricinoleic acid, along with its derivatives, was determined to be the primary active component in castor oil based on a 2004 study. It has skin-smoothing and skin-moisturizing effects and is also used to treat acne [111].

In addition, a 2012 study found that S. aureus, one of the bacteria that causes acne, was successfully inhibited from growing when crude protein extracts from this plant's seed were used [112].

2.4.17 Rosmarinus officinalis

The *Rosmarinus officinalis*, most commonly called the Rosemary, is another medicinal plant that researches support for the treatment or prevention of acne. With this, there are numerous formulations created to help those people with acne. The "Biossance'sSqualane + Tea Tree Balancing Oil" is a facial oil that uses Rosemary as an ingredient in order to reduce acne breakouts. It is formulated in combination with Tea Tree as it helps control excess oil and restores hydration [113]. The "Taharat Night Rosemary Anti Acne Cream" is another product that utilizes Rosemary to combat acne. This product is to be applied during night time and is suitable for normal skin [114].

Rosemary is said to have an anti-inflammatory property that can help treat those with acne. An extract of rosemary is said to contain three bioactive compounds which are identified to be carnosic acid, carnosol, and rosmarinic acid. All three are identified to have effects on the production of cytokine. Tests conducted in vivo on mice show that *P. acnes* induced inflammation was inhibited due to the inhibition or suppression of cytokine production. Moreover, rosemary is said to have the ability to reduce the activation of NF-kB and normalizes the TLR-2 in vitro [115].

Another study conducted in 2022 wanted to know the clinical efficacy of rosemary gel in comparison to the usual medications used for acne vulgaris which is the clindamycin / benzoyl peroxide gel. The results showed that the subjects who use the topical rosemary gel had a faster response to treatment in comparison to those who used the clindamycin / benzoyl peroxide gel. With this, it shows that the rosemary is deemed as a good substitute agent for treating acne [116].

2.4.18 Santalum album Linn

One of the oldest and most sought-after natural fragrances, Santalum album Linn is also known as Indian sandalwood or White Sandalwood and has both major medical and commercial value. [117]. There are numerous formulations containing Sandalwood as an effective way to treat acne vulgaris. According to WInkelman (2018), One of the best treatments for treating acne and reducing acne scars and blemishes is sandalwood powder paste [115]. An example of products that contain Sandalwood formulated into a powder against acne is *"Herbs Botanica Chandan (Sandalwood) Powder"* [118] and *"Pam Herbals Special Sandalwood DIY Powder For Face pack"* [119]. Sandalwood oil is another type of formulation that is readily available in the market and can also help treat acne vulgaris. An example of a product that contains Sandalwood oil is "pureSCRUBS Ultra Moisturizing Sandalwood Body Oil Spray" [120].

The anti-inflammatory, antiseptic, and anti-itching effects of this plant are well known [7]. Xanthomonas campestris (-), Bacillus mycoides (+), Bacillus pumilis (+), E. coli (-), Micrococcus glutamicus (+), Sarcina lutea (+), Salmonella paratyphi (-), Staphylococcus albus (+), and Xanthomonas malvacearum (-) are all susceptible to the essential oils of this plant, according to a 2017 study [121]. A comparative study that screened 26 different kinds of essential oils for their antibacterial properties against axilla bacteria displayed the greatest antibacterial activity for sandalwood oil [122]. According to Warnke et al (2009), Methicillin-resistant Staphylococcus aureus and antimycotic-resistant Candida were both successfully combated by sandalwood oil's antibacterial properties.[123.]. A 2011 study which documented the different home remedies of an Indian household noted that sandalwood was recommended for acne and fungal infections as it has antibacterial and antifungal properties [124]. Additionally, a 2012 study revealed that sandalwood was well tolerated in patients and showed a reduced count in acne lesions in 90% of acne patients tested [125]. Suppression of the COX-1, COX-2, and 12-lipoxygenase pathways, as well as stimulation of keratinocytes and dermal fibroblasts by lipopolysaccharide, are hypothesized to be the mechanisms by which sandalwood has antibacterial effects. [115].

It was also revealed that Sandalwood oil displayed an anti-inflammatory effect when used against formalin induced paw edema in albino rats. These properties are essential in controlling and treating acne vulgaris [121].

2.4.19 Serenoarepens

More commonly called saw palmetto or cabbage palm, the Serenoarepens is part of the arecaceae family and is local to south-east America and the West Indies. The saw palmetto is one of the more popularly used herbal medications used in treating lower urinary tract symptoms (LUTS). The berries have been used to treat erectile dysfunction, prostate swelling, testicular atrophy, and inflammation since the early 1700s. The saw palmetto's berries are also traditionally utilized as a diuretic and in treating patients with diarrhea and stomach ache [126]. Although most saw palmetto products are in capsule form and are targeted to aid in prostate health, a product that uses the *Serenoarepens* as its main ingredient for topical skin care is the Bianca Rosa Saw Palmetto Cream [127].

Clinicians make use of the *Serenoarepens*' fruit in cases where patients with acne vulgaris exhibit high serum androgens or have a polycystic ovarian syndrome. The fruit negates the effects of the high levels of androgen by the moderate inhibition of the 5-reductase and also with its ability to antagonize the androgen receptor. The 5-reductase is involved and responsible in activating testosterone into dihydrotestosterone which results in greasy skin and formation of acne. Furthermore, the counter attacks help in limiting skin acne as the *Serenoarepens*' standardized lipophilic extract constricts the pilosebaceous unit overproduction of sebum. The extracts also constrain the enzyme cyclo-oxidase which is responsible for releasing inflammation mediators [128,129].

2.4.20 Simmondsiachinensis Schneider

Jojoba, often referred to as Simmondsiachinensis Schneider, is a desert shrub that is indigenous to the Sonoran desert in the southwest of the United States and northern Mexico [130]. Jojoba oil, which is currently employed in the cosmetic, pharmaceutical, and biofuel industries, is its most valued product [130]. The market today offers a variety of formulations that consumers could buy to utilize the anti-acne effects of jojoba. One formulation is in a facial mask form. The product named "Beauty by Earth Hydrating Facial Mask" is a facial mask that utilizes jojoba oil to help cleanse the face [131]. Another popular formulation for this plant that is utilized in the market today is its essential oil. An example of a product that utilizes the natural oils of the jojoba is the Now Organic Jojoba oil [132]

Straight chain monomers comprising C-20 and C-22 alcohols and acids, as well as two double bonds, make up the oil [133]. A study noted that this oil is effective in combating acne and psoriasis [134].

Numerous products and cosmetics (including lipstick, skin creams, skin fresheners, winter care lotions, shampoo, moisturizer, soap), lubricant, anti-foaming agents, electrical insulators, and plastic industries employ liquid wax and derivatives from the jojoba plant [135]. Additionally, it has medical benefits for the treatment of skin conditions, ulcers, wounds, burnt skin, and the removal of stretch marks in addition to pharmaceutical usage for coating pills and producing antibiotics [130].

2.4.21 Saponaria officinalis Linn

The *Saponaria officinalis Linn* is a plant capable of producing flowers and could live for longer periods of time. It is one of the more recognizable genus within the *Saponaria* (Caryophyllaceae) species. These plants are a native to Asian and European countries and are more commonly identified as soapworts. The plant's substantially high content of triterpene saponins is helpful in creating a gentle liquid soap which is made from the boiling of its roots or leaves in water [136]. Examples of products where the extracts of *Saponaria officinalis Linn* was used as an ingredient are the Alana Mitchell Daily OC Cream Cleanser and Juniper & Soapwort Gentle Cleanser. They are deep acting cleansers which are suitable especially for anyone with oily, acne-prone skin, and skins with enlarged pores [137,138].

The *Saponaria officinalis Linn* is also traditionally used all throughout the world for different medicinal uses. When rubbed onto the skin, the leaves could function as a sanitizer and repellant. Moreover it could utilized as a diuretic and can be used for diseases associated to the liver.The roots of this plant are also traditionally used to aid in several ailments such as stomach disorder, rheumatism, cough, bronchitis, bile disorders, respiratory system diseases, urine remover, bone deformations, liver problems, and skin diseases, especially pimples or acne. The plant's saponins are ribosome inhibitory proteins and are synthesized by the plant to exhibit antioxidant, insecticidal, antimicrobial, and anticancer effects [139].

Various studies were conducted which included both in vitro and in vivo types on the *Saponaria officinalis Linn* extracts wherein it was observed for antibacterial, anti-inflammatory, antimicrobial, and anti-sebum properties. Compared to a control/reference antibiotic for acne treatment Chloramphenicol, the antibacterial activity of *Saponaria officinalis Linn* extracts against *Propionibacterium acnes* was 1.2 times stronger than the reference antibiotic [140].

2.4.22 Taraxacumofficinale Linn

Taraxacumofficinale which is commonly known as dandelion, is a member of the Asteraceae, where the sunflower and other flower with yellow bloom belong. Its leaves, stems, and roots are often used in traditional Chinese medicine for various medical purposes, and it is effective in treating acne. [141]. There are a few products that use Taraxacum to treat acne. The main content of the products in the market is TaraxacumOfficinale Extract. Dandelion Extract has hydrating, cleansing, nourishing, toning, anti-inflammatory, and acne-fighting properties. Dandelion Extract is also used in shampoo, conditioner, and skin care products [142]. A product well known in the market is the Flower Dandelion Facial Toner, which restores PH balance and avoids drying after cleansing. This multifunctional beauty product, packed with witch hazel extract, dissolves dead skin cells and oil to cleanse pores [143].

In traditional Chinese medicine, the dandelion root extract possesses the most significant therapeutic effect.Studies found that dandelion contains bioactive compounds such as taraxasterol (TS), sesquiterpene lactones, caffecicacid, chlorogenic acid, p-coumaric acid, sinapic acid, ferulic acid, cichoric acid, and taraxinic acid—D-glucopyranoside that contribute to its anti-inflammatory, antiviral, and antioxidant properties. [144].

According to studies and medicinal journals, Taraxacumofficinale is found to reduce inflammation and pain. It also showed that the dandelion has pharmacological properties that can treat and fight warts, eczema, acne-prone skin, and other skin problems in traditional medicine. This plant is well known to be an additive to acne ointments, especially those ointments that use traditional and herbal components as part of a natural treatment [141].

2.4.23 Thymus vulgaris Linn

Garden thyme, or Thymus vulgaris Linn, is a fragrant flowering plant native to the Mediterranean region with known pharmacological effects that include antimicrobial, anti-oxidant, anti-inflammatory, antiviral, and anticancer effects [145]. There are a plethora of products today that utilize thyme for its benefits against acne. One popular type of formulation used today is tincture-type formulations for thyme. One example of a Thyme tincture is the Thyme tincture from Herb Pharm [146].

The essential oil of this plant was discovered to be effective against P. acnes in a 2010 study in which various essential oils were tested for their antibacterial activity against the bacterium thought to be the cause of acne [147].

2.4.24 Viola tricolor Linn

Viola tricolor, also known as Heartsease, is a tiny plant and It like to be in partial shade. Flavonoids, Polysaccharides, Phenolic Acids, Volatile Oils, Carotenoids, Anthocyanins, and Cyclotides are among the secondary metabolites found in *Viola tricolor*. During the Middle Ages, heartsease medicines were mostly utilized to treat various skin disorders. Viola extract has antibacterial action, anti-inflammatory, gram-positive and gram-negative and other therapeutic benefits, according to laboratory tests [148]. An example of a formulation containing *Viola tricolor* is Herbal Extract Heartsease EG which comes from the entire herb of *Viola tricolor* and is a hydroglycolic extract. It has anti-blemish therapeutic and calming effects used in lotions to reduce blemishes [149].

Furthermore, *Viola tricolor* has been used as a topical home remedy for skin conditions such as eczema and acne duringthe past. Natural medicine formulations employ the dried aerial portions of the viola [150]. It includes a variety of therapeutic polyphenols, as well as salicylic acid which is a well-known antibacterial ingredient included in many advertising and alternative acne treatments [151]. Bulgarians use it to cure coughs, rashes, and skin conditions including acne, and also used to treat psoriasis in Italy. The ethanolic extract of the entire plant inhibited many bacteria including Propionibacterium acnes [150]. Additionally, it is an antioxidant, has anti-inflammatory properties, and its extract compresses, calms and relieves acne-related irritation [152].

Conclusion

One of the most common skin conditions is acne vulgaris, influencing the most, if not all, people's lives at some point. To find the finest treatment choices for acne, it is necessary to research a wide range of therapy possibilities. Numerous clinical studies have found that traditional herbs have demonstrated promising action for the treatment of acne. This journal review paper focused on the herbal considerations for the treatment of acne. From ancient times till the present, communities have relied heavily on natural sources of medicine to cure a wide range of ailments and diseases. Therefore, these should be investigated further using more advanced technologies as they may offer secure substitutes for synthetic acne medications. Additionally, the results of additional research could assist dermatologists, researchers, cosmetic surgeons, and other healthcare professionals in using this natural source of medicine for dermal topical formulations, which leads to the most natural method of treating acne with the most advantages and the least side effects of synthetic medication. Overall, the use of plants and herbs for the treatment of Acne Vulgaris.However, more study is required to confirm their safety, effectiveness, and effectiveness against acne.

References

1. Lambrechts, I. A., de Canha, M. N., &Lall, N. (2018). Exploiting medicinal plants as possible treatments for acne vulgaris. In Medicinal Plants for Holistic Health and Well-Being (pp. 117-143). Academic Press.
2. Stamu-O'Brien C, Jafferany M, Carniciu S, Abdelmaksoud A. Psychodermatology of acne: Psychological aspects and effects of acne vulgaris. J Cosmet Dermatol. 2021 Apr;20(4):1080-1083. doi: 10.1111/jocd.13765. Epub 2020 Oct 23. PMID: 33031607.
3. Tayel, K., Attia, M., Agamia, N. et al. Acne vulgaris: prevalence, severity, and impact on quality of life and self-esteem among Egyptian adolescents. J. Egypt. Public. Health. Assoc. 95, 30 (2020). https://doi.org/10.1186/s42506-020-00056-9
4. Acne types. (2018, June 7). acne support. https://www.acnesupport.org.uk/acne-types/
5. Mossman, J., BSPh, &RPh President and Pharmacist in Charge Taos Pharmacy and Total Health and Wellness Center Taos, New Mexico. (2006, April 17). Preventing and treating acne. U.S. Pharmacist – The Leading Journal in Pharmacy. https://www.uspharmacist.com/article/preventing-and-treating-acne
6. Dey P, Karuna DS, Bhakta T. Medicinal plants used as anti-acne agents by tribal and non-tribal people of Tripura, India. AJPCT 2014;2:556-70.

7. Athikomkulchai, Sirivan&Watthanachaiyingcharoen, Rith. (2008). The development of anti-acne products from Eucalyptus globulus and Psidium Guajava oil. 22.
8. Nasri, H., Bahmani, M., Shahinfard, N., Moradi Nafchi, A., Saberianpour, S., &RafieianKopaei, M. (2015). Medicinal Plants for the Treatment of Acne Vulgaris: A Review of Recent Evidences. Jundishapur journal of microbiology, 8(11), e25580. https://doi.org/10.5812/jjm.25580
9. Reddy, D. M., & Jain, V. (2019). An overview on medicinal plants for the treatment of acne. *Journal of Critical Reviews*, *6*(6), 7-14. https://doi.org/10.22159/jcr.2019v6i6.35696
10. Liao, D. C. (2003). Management of acne. J Fam Pract, 52(1), 43-51.
11. Batista, A. S. F., & Ana, P. (2016). Types of Acne and Associated Therapy: A Review. Amr Res J Pharm, 9.
12. 12. Mark D. Farrar; Eileen Ingham (2004). Acne: Inflammation. , 22(5), 0–384. doi:10.1016/j.clindermatol.2004.03.006
13. Shalita, A. R. (2004). Acne: clinical presentations. Clinics in dermatology, 22(5), 385-386.
14. Bhate, K. & Williams, H.C. (2013). Epidemiology of acne vulgaris. British Journal of Dermatology, 168(3), 474–485. doi:10.1111/bjd.12149
15. Muggu Skincare. (2022). Blackheads vs. Whiteheads: What's the Difference?. https://himuggu.com/blogs/news/blackheads-vs-whiteheads-what-s-the-difference
16. Fletcher, J.(2019).What to know about pustules.https://www.medicalnewstoday.com/articles/325342
17. Palmer, A. (2020). Acne Papules Causes and Treatments. https://www.verywellhealth.com/papule-definition-of-an-acne-papule-15541
18. Healthline. (2022). What Is Nodular Acne and How Is It Treated?. https://www.healthline.com/health/beauty-skin-care/nodular-acne
19. Cherney, K. (2019). What Is Cystic Acne and How Is It Treated?. https://www.healthline.com/health/beauty-skin-care/cystic-acne
20. Salameh, F., Shumaker, P. R., Goodman, G. J., Spring, L. K., Seago, M., Alam, M., ... &Artzi, O. (2022). Energy- based devices for the treatment of Acne Scars: 2022 International consensus recommendations. Lasers in surgery and medicine, 54(1), 10-26.
21. Bhatia, A., Maisonneuve, J.F., &Persing, D.H. (2004) PROPIONIBACTERIUM ACNES AND CHRONIC DISEASES. In: Institute of Medicine (US) Forum on Microbial Threats. The Infectious Etiology of Chronic Diseases: Defining the Relationship, Enhancing the Research, and Mitigating the Effects: Workshop Summary. Washington (DC): National Academies Press (US). Available from:https://www.ncbi.nlm.nih.gov/books/NBK83685/
22. Danby, F. W. (2015). Acne: Causes and practical management. Wiley-Blackwell.
23. Rosenfield R. L. (2021). Normal and Premature Adrenarche. *Endocrine reviews*, *42*(6), 783–814. https://doi.org/10.1210/endrev/bnab009
24. Martinez, G., Copen, C. E., &Abma, J. C. (2011). Teenagers in the United States: sexual activity, contraceptive use, and childbearing, 2006-2010 national survey of family growth. Vital and health statistics. Series 23, Data from the National Survey of Family Growth, (31), 1–35.
25. Lynn, D., Umari, T., Dellavalle, R., & Dunnick, C. (2016). The epidemiology of acne vulgaris in late adolescence. Adolescent Health, Medicine and Therapeutics, 13. doi:10.2147/AHMT.S55832
26. Bataille, V., Snieder, H., MacGregor, A. J., Sasieni, P., & Spector, T. D. (2002). The influence of genetics and environmental factors in the pathogenesis of acne: a twin study of acne in women. The Journal of investigative dermatology, 119(6), 1317–1322. https://doi.org/10.1046/j.1523-1747.2002.19621.x
27. Melnik, B. C., John, S. M., &Plewig, G. (2013). Acne: risk indicator for increased body mass index and insulin resistance. Acta dermato-venereologica, 93(6), 644–649. https://doi.org/10.2340/00015555-1677
28. Zouboulis C. C. (2014). Acne as a chronic systemic disease. Clinics in dermatology, 32(3), 389–396. https://doi.org/10.1016/j.clindermatol.2013.11.005
29. Di Landro, A., Cazzaniga, S., Parazzini, F., Ingordo, V., Cusano, F., Atzori, L., Cutrì, F. T., Musumeci, M. L., Zinetti, C., Pezzarossa, E., Bettoli, V., Caproni, M., Lo Scocco, G., Bonci, A., Bencini, P., Naldi, L., & GISED Acne Study Group (2012). Family history, body mass index, selected dietary factors, menstrual history, and risk of moderate to severe acne in adolescents and young adults. Journal of the American Academy of Dermatology, 67(6), 1129–1135. https://doi.org/10.1016/j.jaad.2012'.02.018
30. Halvorsen, J. A., Vleugels, R. A., Bjertness, E., & Lien, L. (2012). A population-based study of acne and body mass index in adolescents. Archives of dermatology, 148(1), 131–132. https://doi.org/10.1001/archderm.148.1.131
31. French, S. A., Story, M., Neumark-Sztainer, D., Fulkerson, J. A., & Hannan, P. (2001). Fast food restaurant use among adolescents: associations with nutrient intake, food choices and behavioral and psychosocial variables. International journal of obesity and related

metabolic disorders : journal of the International Association for the Study of Obesity, 25(12), 1823–1833. https://doi.org/10.1038/sj.ijo.0801820

32. Ismail, N. H., Manaf, Z. A., &Azizan, N. Z. (2012). High glycemic load diet, milk and ice cream consumption are related to acne vulgaris in Malaysian young adults: a case control study. BMC dermatology, 12, 13. https://doi.org/10.1186/1471-5945-12-13
33. Zouboulis, C. C., Jourdan, E., & Picardo, M. (2014). Acne is an inflammatory disease and alterations of sebum composition initiate acne lesions. Journal of the European Academy of Dermatology and Venereology : JEADV, 28(5), 527–532. https://doi.org/10.1111/jdv.12298
34. Jović, A., Marinović, B., Kostović, K., Čeović, R., Basta-Juzbašić, A., &BukvićMokos, Z. (2017). The Impact of Psychological Stress on Acne. Acta dermatovenerologicaCroatica : ADC, 25(2), 1133–1141.
35. Suh, D. H., Kim, B. Y., Min, S. U., Lee, D. H., Yoon, M. Y., Kim, N. I., Kye, Y. C., Lee, E. S., Ro, Y. S., & Kim, K. J. (2011). A multicenter epidemiological study of acne vulgaris in Korea. International journal of dermatology, 50(6), 673–681. https://doi.org/10.1111/j.1365-4632.2010.04726.x
36. Chiu, A., Chon, S. Y., & Kimball, A. B. (2003). The response of skin disease to stress: changes in the severity of acne vulgaris as affected by examination stress. Archives of dermatology, 139(7), 897–900. https://doi.org/10.1001/archderm.139.7.897
37. Feldman S, Careccia RE, Barham KL, Hancox J. Diagnosis and treatment of acne. Am Fam Physician. 2004 May 1;69(9):2123-30. PMID: 15152959.
38. Acne - Symptoms and causes. (2022, May 25). Mayo Clinic. https://www.mayoclinic.org/diseases conditions/acne/symptoms-causes/syc 20368047#:%7E:text=Overview,but%20acne%20can%20be%20persistent
39. Acne: Treatment, Types, Causes & Prevention. (2020, January 9). Cleveland Clinic. https://my.clevelandclinic.org/health/diseases/12233-acne
40. Khan, Samreen& Shamsi, Yasmeen & Jahangir, Umar &Manjhi, Mukesh. (2021). REVIEW ON AZADIRACHTA INDICA LEAVES RELATED TO ITS ACTION AGAINST ACNE VULGARIS. Indian Journal of Unani Medicine. 14. 10.53390/ijum.v14i1.2.
41. Mossini, S.A.G.; Kemmelmeier, C. A árvoreNim (Azadirachtaindica A. Juss): MúltiplosUsos. Acta Farm. Bonaer. 2005, 24, 139–148.
42. Himalaya anti acne treatment neem facial cleanser purifying turmeric face wash ayurvedic oil control face care keep skin pure|Treatments& Masks| - AliExpress. (n.d.). aliexpress.com. https://www.aliexpress.com/item/2255799899108866.html?gatewayAdapt= 4itemAdapt
43. Neem (Azadirachta Indica). (n.d.). Millennium Herbal Care. https://millenniumherbal.com/pages/neem-azadirachta-indica
44. Goro, K. (n.d.). Anti-acne cleansing flakes. DERMADIS by AURUMARIS. https://dermadis.eu/products/anti-acne-cleansing-flakes-betula-tar
45. SolAcne full anti-acne protection set. (n.d.). SolAcne | Anti-acne products. https://www.solacne.com/solacne-combo-pack
46. Malinowska, P. (2012). A new idea for formulations of multifunctional cosmetics intended for acne prone skin. Marcin Pigłowski: Jednostkauznanaijednostkiakredytujące w systemieoceny, 95.
47. V.Yogiraj, P.K. Goyal, C.S. Chauhan, A. Goyal, B. Vyas, "Carica papaya Linn: An Overview,"International Journal of Herbal Medicine, vol 2, no. 5, pp. 01-08. 2014.
48. T. Vij, Y. Prashar, "A Review on Medicinal Properties of Carica papaya Linn,"AsianPacific Journal of Tropical Disease,vol 5, no. 1, pp. 1-6. 2015.
49. Anibijuwon II, A.O Udeze", Antimicrobial Activity of Carica Papaya (Pawpaw Leaf)onSomePathoenic Organisms of Clinical Origin from South-Western Nigeria,"Ethnobotanical Leaflets, vol. 7, no. 4, pp. 850-864. 2009.
50. A.C. Emeruwa, "Antibacterial Subbstance From Carica papaya Fruit Extract,"JournalofNatural Products, vol. 45, no. 2, pp. 123-127. 1982.
51. Pertiwi, D., Hafiz, I., & Salma, R. (2019). Antibacterial Activity of Ethanol Extract of Papaya leaves (Carica papaya L.) Gel against P.acnes. Indonesian Journal of Pharmaceutical and Clinical Research, 2(1). https://doi.org/10.32734/idjpcr.v2i1.869
52. F. (2015). SILKA Green Papaya Skin Fairness And Anti Acne Soap. Cosmetique Asia. https://www.cosmetiqueasia.com/silka
53. Chen, S.; Zheng, T.; Ye, C.; Huannixi, W.; Yakefu, Z.; Meng, Y.; Peng, X.; Tian, Z.; Wang, J.; Ma, Y.; et al. Algicidal properties of extracts from Cinnamomumcamphora fresh leaves and their main compounds. Ecotoxicol. Environ. Saf. 2018, 163, 594–603.
54. Lee, H.J.; Hyun, E.A.; Yoon, W.J.; Kim, B.H.; Rhee, M.H.; Kang, H.K.; Cho, J.Y.; Yoo, E.S. In vitro anti-inflammatory and anti-oxidative effects of Cinnamomumcamphora extracts. J. Ethnopharmacol. 2006, 103, 208–216.
55. Camphor Essential Oil 4 OZ – Pure camphor oil, therapeutic grade, undiluted, non-GMO – boost circulation, soothe sore muscles and joints, respiratory and congestion relief, aromatherapy with dropper. (n.d.). UpNature. Retrieved June 24, 2022,

fromhttps://upnature.com/products/camphor-essential-oil-4-oz-pure-camphor-oil-therapeuticgrade-undiluted-non-gmo-boost-circulation-soothe-sore-muscles-and-joints-respiratory-and congestion-relief-aromatherapy-with-dropper

56. Avnii Organics Pure Natural Camphor Essential Oil For Relieves Skin Itching And Irritation Rashes Cures Acne and Boosts Hair Growth15 ml. (n.d.). Getkraft. Retrieved July 3, 2022, from https://www.getkraft.com/product/avnii-organics-pure--natural-camphor-essential-oil-for relieves-skin-itching-and-irritation-rashes-cures-acne-and-boosts/1920

57. Guo, S.; Geng, Z.; Zhang, W.; Liang, J.; Wang, C.; Deng, Z.; Du, S. The chemical composition of essential oils from Cinnamomumcamphora and their insecticidal activity against the stored product pests. Int. J. Mol. Sci. 2016, 17, 1836.

58. Sinha, P., Srivastava, S., Mishra, N., & Yadav, N. P. (2014). New perspectives on antiacne plant drugs: contribution to modern therapeutics. BioMed research international, 2014, 301304. https://doi.org/10.1155/2014/301304

59. Taiwo, S. S., Oyekanmi, B. S., Adesiji, Y. O., Opaleye, O. O., &Adeyeba, O. A. (2007). In vitro Antimicrobial Activity of Crude Extracts of Citrus aurantifolia Linn and TithoniadiversifoliaPoaceae on Clinical Bacterial Isolates. International Journal of Tropical Medicine, 2(4), 113–117.

60. Hussein, H. O. (2016). Antimicrobial activity for crude watery extract of seeds of citrus aurantifolia (lime fruit) against gram positive and negative bacteria in vitro. مجلة كلية المأمون , 404. https://doi.org/10.36458/1253-000-027-020

61. Bitter orange (citrus aurantium). Ecco Verde Online Shop. (n.d.). Retrieved from https://www.ecco verde.com/info/ingredients/bitter-orange

62. Bitter orange astringent toner. aesopskincare.ph. (n.d.). Retrieved from https://aesopskincare.ph/products/bitter-orange-astringent-toner

63. Chea, S. K. P., Momo, H. S., &Yaba, K. (2021). Antibacterial Effect of Zingiberofficinale Roscoe and Citrusaurantifolia Linn Crude Extracts against Selected Pathogenic Bacterial Species. International Journal of Basic & Applied Sciences, 21(1), 27–30.

64. Hariyadi, D. M., Isnaeni, I., Sudarma, S., Suciati, S., & Rosita, N. (2020). Peel-off emulgelmask of Cocos nucifera L. Extract using gelling agent carbomer 940 as antiacne against Propionibacterium acnes ATCC 11827. Journal of advanced pharmaceutical technology & research, 11(4), 220– 225. https://doi.org/10.4103/japtr.JAPTR_51_20

65. Iavarone, K. (2022, January 25). 10 of the best coconut oils for the face in 2022. MNT. https://www.medicalnewstoday.com/articles/coconut-oil-for-face#Cocokind-Facial-Repair-Oil

66. Dey, P., Karuna, D. S., & Bhakta, T. (2014). Medicinal Plants used as Anti-Acne Agents by Tribal and Non-Tribal People of Tripura, India. Regional Institute of Pharmaceutical Science & Technology.

67. Ibrahim, A., Salih, T., Ibrahimc, S., & Al-Noor, T. (2018). Facial Acne Therapy by Using Pumpkin Seed Oil with Its Physicochemical Properties. Applied Science Reports, 23(1). https://doi.org/10.15192/PSCP.ASR.2018.23.1.3947

68. MBK Clinical Skincare Solutions Pumpkin Cleanse ingredients (Explained). (2021, March 14). INCIDecoder. https://incidecoder.com/products/mbk-clinical-skincare-solutions-pumpkin-cleanse

69. Bussaman, P., Rattanasena, P., &Namsena, P. (2015). Antimicrobial activities of some local plants of Thailand against acne-producing bacteria. Food and Applied Bioscience Journal, 3(3), 184-192.

70. Vaughn, Alexandra R.; Branum, Amy; Sivamani, Raja K. (2016). Effects of Turmeric (Curcuma longa) on Skin Health: A Systematic Review of the Clinical Evidence. Phytotherapy Research, 30(8), 1243– 1264. doi:10.1002/ptr.5640

71. Krup, V., Prakash, L. H., & Harini, A. (2013). Pharmacological activities of turmeric (Curcuma longa Linn): a review. J HomeopAyurv Med, 2(133), 2167-1206.

72. OEM private label handmade skin care Tumeric toilet soap body facial cleansing whitening acne face turmeric soap. (n.d.). Alibaba.com: Manufacturers, Suppliers, Exporters & Importers from the world's largest online B2B marketplace. https://www.alibaba.com/pla/OEM-Private-Label-Handmade-SkinCare_1600438659116.html?mark=google_shopping&biz=pla&searchText=Soap&product_id=1600438659116&pcy=US&src=sem_ggl&from=sem_ggl&cmpgn=16509554838&adgrp=139882388368&fditm=&tgt=pl293946777986&locintrst=&locphyscl=9066807&mtchtyp=&ntwrk=u&device=c&dvcmdl=&creative=586657547185&plcmnt=&plcmntcat=&p1=&p2=&aceid=&position=&localKeyword=&pla_prdid=1600438659116&pla_country=PH&pla_lang=en&gclid=CjwKCAjw77WVBhBuEiwAJYoJA6nnfqPlyka99IQ3Y0I4hogRvITW9syhpTqxvLH2y_ao8ZuFVec0BoChRgQAvD_BwE

73. 73. Herb turmeric dark spot treatment moisturizer whitening lightening against acne face cream. (n.d.). Made-in-China.com. https://m.made-in-china.com/product/Herb-Turmeric-Dark-Spot-Treatment Moisturizer-Whitening-Lightening-Against-Acne-Face-Cream-1906580651.html

74. Eucalyptus essential oil - 15ml for skin, hair, face, acne care. (n.d.). Aura Decor. https://auradecor.co.in/products/eucalyptus-essential-oil-15ml-for-skin-hair-face-acne-care can-be-used-as-fragrance-oil-mixed-with-beauty-products-aromatherapy-and-home-candle-soap making

75. Takahashi, T., Kokubo, R., &Sakaino, M. (2004). Antimicrobial activities of eucalyptus leaf extracts and flavonoids from Eucalyptus maculata. Letters in applied microbiology, 39(1), 60-64.

76. Athikomkulchai, Sirivan&Watthanachaiyingcharoen, Rith. (2008). The development of anti-acne products from Eucalyptus globulus and Psidium Guajava oil. 22.

77. Organic eucalyptus/Eukalipto for acne prevention healthy Vibrance and glow - Single (1X90grams) | Lazada PH. (n.d.). Lazada Philippines: Online Shopping Philippines with Great Prices!. https://www.lazada.com.ph/products/organic-eucalyptuseukalipto-for-acne-prevention healthy-vibrance-and-glow-single-1x90grams-i1743926828.html

78. Thakur AK, Raj P (2017) Pharmacological Perspective of Glycyrrhiza Glabra Linn.: a Mini Review. J Anal Pharm Res 5(5): 00156. DOI: 10.15406/japlr.2017.05.00156

79. Nam, C.; Kim, S.; Sim, Y.; Chang, I. (2003). Anti-Acne Effects of Oriental Herb Extracts: A Novel Screening Method to Select Anti-Acne Agents. Skin Pharmacology and Physiology, 16(2), 84–90. doi:10.1159/000069030

80. Kraft K. Erkrankungen der Haut (II). WeitereEkzemformen, Akne und Pruritus. [Diseases of the skin (II). Other eczema types, acne and pruritus]. Z Phytotherapie 2007; 28 (3): 129-33

81. Principe, M. (2020, December 16). Licorice is the sneaky skincare ingredient that'll give you a smooth, radiant glow. HelloGiggles. https://hellogiggles.com/beauty/skin/licorice-root-skin-benefits

82. Piazza, S.; Martinelli, G.; Vrhovsek, U.; Masuero, D.; Fumagalli, M.; Magnavacca, A.; Pozzoli, C.; Canilli, L.; Terno, M.; Angarano, M.; et al. Anti-Inflammatory and Anti-Acne Effects of Hamamelis virginiana Bark in Human Keratinocytes. Antioxidants 2022, 11, 1119. https://doi.org/10.3390/antiox11061119

83. Walden, H. (2021, June 9). Witch Hazel for acne: Does it work? How to use it, side effects and more. Derm Collective. https://dermcollective.com/witch-hazel-for-acne/

84. Dickinson's original Witch Hazel pore perfecting toner - dickinson's Witch Hazel skincare. (2021, October 13). Dickinson's Witch Hazel Skincare. https://dickinsonsusa.com/our products/dickinsons-original-witch-hazel-pore-perfecting-toner/

85. Committee on Herbal Medicinal Products. Final Community Herbal Monograph on Hamamelis virginiana L., Folium; Doc. Ref.: EMA/HMPC/114586/2008; European Medicines Agency: London, UK, 2010

86. Committee on Herbal Medicinal Products. Assessment Report on Hamamelis Virginiana l., Cortex Hamamelis Virginiana l., Folium Hamamelis Virginiana l., Folium et Cortex autRamunculusDestillatum; Doc. Ref.: EMA/HMPC/114585/2008; European Medicines Agency: London, UK, 2010

87. Deters, A.; Dauer, A.; Schnetz, E.; Fartasch, M.; Hensel, A. High molecular compounds (polysaccharides and proanthocyanidins) from Hamamelis virginiana bark: Influence on human skin keratinocyte proliferation and differentiation and influence on irritated skin. Phytochemistry 2001, 58, 949–958

88. Mohan, L., Amberkar, M. V., & Kumari, M. (2011). Ocimum sanctum linn.(TULSI)-an overview. Int J Pharm Sci Rev Res, 7(1), 51-53.

89. Ocimum sanctum, leaf powder. (n.d.). Banyan Botanicals. https://www.banyanbotanicals.com/tulsi powder/

90. Tulsi (Holy Basil) Oil. (n.d.). doterra.com. https://www.doterra.com/US/en/p/tulsi-holy-basil-oil

91. Taleb, M. H., Abdeltawab, N. F., Shamma, R. N., Abdelgayed, S. S., Mohamed, S. S., Farag, M. A., & Ramadan, M. A. (2018). Origanum vulgare L. essential oil as a potential anti-acne topical nanoemulsion—In vitro and in vivo study. Molecules, 23(9), 2164.

92. Fiorucci, S., Meli, R., Bucci, M., &Cirino, G. (2001). Dual inhibitors of cyclooxygenase and 5- lipoxygenase. A new avenue in anti-inflammatory therapy?. Biochemical pharmacology, 62(11), 1433- 1438.

93. Lertsatitthanakorn, P., Taweechaisupapong, S., Aromdee, C., &Khunkitti, W. (2006). In vitro bioactivities of essential oils used for acne control. International Journal of Aromatherapy, 16(1), 43- 49.

94. Prakash, P. A. G. N., & Gupta, N. (2005). Therapeutic uses of Ocimum sanctum Linn (Tulsi) with a note on eugenol and its pharmacological actions: a short review. Indian journal of physiology and pharmacology, 49(2), 125.

95. Chaiyana, W., Punyoyai, C., Sriyab, S., Prommaban, A., Sirilun, S., Maitip, J., ... &Anuchapreeda, S. (2022). Anti- Inflammatory and Antimicrobial Activities of Fermented Ocimum sanctum Linn. Extracts against Skin and Scalp Microorganisms. Chemistry & Biodiversity, 19(2), e202100799.

96. CHITRAK - Phyto Life Sciences. (2022). SpecialChem. https://cosmetics.specialchem.com/product/i-phyto-life-sciences-chitrak

97. Sharma, N., & Kaushik, P. (2014). Medicinal, biological and pharmacological aspects of plumbago zeylanica (Linn.). Journal of Pharmacognosy and Phytochemistry. https://www.phytojournal.com/archives/2014/vol3issue4/PartB/12.1.pdf

98. Markandeya, D.A. (2011). Antimicrobial and Phytochemical Screening of Plumbago zeylanica Linn. (Plumbaginaceae) Leaf. Journal of Experimental Sciences, 2, 04-06.

99. Suman, P., et al. (2013). Antimicrobial and antioxidant synergy of Psoraleacorylifolialinn. And Plumbagozeylanicalinn. International Journal of Pharmaceutical Sciences and Research, 4(2). https://www.researchgate.net/profile/SumanPolaki/publication/236873357_ANTIMICROBIAL_AND_ANTIOXIDANT_SYNERGY_OF_PSORALEA_CORYLIFOLIA_LINN_AND_PLUMBAGO_ZEYLANICA_LINN/links/5fbce4bb458515b79764c737/ANTIM ICROBIAL-AND-ANTIOXIDANT-SYNERGY-OF-PSORALEA-CORYLIFOLIA-LINN-AND-PLUMBAGO ZEYLANICA-LINN.pdf

100. Biswas TK, Maity LN, Mukherjee B. Wound healing potential of Pterocarpus santalinuslinn: a pharmacological evaluation. Int J Low Extrem Wounds. 2004 Sep;3(3):143-50. doi: 10.1177/1534734604268385. PMID: 15866805.

101. Manjunatha, Bukkambudhi. (2006). Antibacterial activity of Pterocarpus santalinus. Indian Journal of Pharmaceutical Sciences. 68. 10.4103/0250-474X.22982.

102. ENN Ac Nay Anti-Acne Face Mask ingredients (Explained). (2021, February 22). INCIDecoder. https://incidecoder.com/products/enn-ac-nay-anti-acne-face-mask

103. Biswas TK, Maity LN, Mukherjee B. The clinical evaluation of Pterocarpus santalinus Linn. Ointment on lower extremity wounds--a preliminary report. Int J Low Extrem Wounds. 2004 Dec;3(4):227-32. doi: 10.1177/1534734604271031. PMID: 15866819.

104. Gao, L., Xu, X., & Yang, J. (2013). Chemical constituents of the roots of Rheum officinale. Chemistry of Natural Compounds, 49(4), 603–605. https://doi.org/10.1007/s10600-013-0689-7

105. Eminence Organics Skin Care. (n.d.) Here's why skin care experts love rhubarb!.Retrieved fromhttps://eminenceorganicfarm.com/skin-care-experts-love-rhubarb/

106. Yuan, S., Jian, T., Li, W., & Huang, Y. (2019). Extraction process optimization and activity assays of antioxidative substances from Rheum officinale. Journal of Food Measurement and Characterization, 14(1), 176–184. https://doi.org/10.1007/s11694-019-00279-1 Eminence Organics Skin Care. (n.d.) Here's why skin care experts love rhubarb!. Retrieved from https://eminenceorganicfarm.com/skincare-experts-love-rhubarb/

107. Rana, M., Dhamija, H., Prashar, B., & Sharma, S. (2012). Ricinus communis L.—a review. International Journal of PharmTech Research, 4(4), 1706-1711.

108. BriogeoB.Well Organic Cold-Pressed 100% Castor Oil. (n.d.).Briogeo.**https://briogeohair.com/products/b-well-organic-cold-pressed-100-castor-oil**.

109. Cetaphil Derma Control Foam Wash. (n.d.).iHerb.https://ph.iherb.com/pr/cetaphil-dermacontrol-oil-removing-foam-wash-oily-sensitive-skin-8-fl-oz-237-ml/92049

110. Jena, J., & Gupta, A. K. (2012). Ricinus communis Linn: a phytopharmacological review. International Journal of Pharmacy and Pharmaceutical Sciences, 4(4), 25-29.

111. Wagner, S., Suter, A., &Merfort, I. (2004). Skin penetration studies of Arnica preparations and of their sesquiterpene lactones. Planta medica, 70(10), 897-903.

112. Al-Mamun, M. A., Akter, Z., Uddin, M. J., Ferdaus, K. M. K. B., Hoque, K. M. F., Ferdousi, Z., & Reza, M. A. (2016). Characterization and evaluation of antibacterial and antiproliferative activities of crude protein extracts isolated from the seed of Ricinus communis in Bangladesh. BMC complementary and alternative medicine, 16(1), 1-10.

113. Nast, C. (2017, October 10). 14 facial oils that won't make acne-prone skin break out. Allure. https://www.allure.com/gallery/best-facial-oils-for-acne

114. Rosemary anti acne cream. (n.d.). indiamart.com. https://www.indiamart.com/proddetail/rosemary-anti-acne-cream 22445460548.html

115. Winkelman, W. J. (2018). Aromatherapy, botanicals, and essential oils in acne. Clinics in dermatology, 36(3), 299-305

116. Masoud, F., Badali, P., Isa, M. A., Alamdari, H. A., Asnaashari, S., Shokri, J., &Javadzadeh, Y. (2022). The novel topical herbal gel might be an alternative treatment in patients with acne vulgaris: A randomized, double-blind controlled study. Phytomedicine Plus, 2(2), 100232.

117. Kumar, R., Anjum, N., & Tripathi, Y. C. (2015). Phytochemistry and pharmacology of Santalum album L.: a review. World Journal of Pharmaceutical Research, 4(10), 1842-1876.

118. Herbs Botanica Chandan (Sandalwood) Powder. (n.d.). Amazon.com. https://www.amazon.com/Herbs-Botanica-Sandalwood-AuspiciousOccasions/dp/B08VGMH237?dchild=1&keywords=sandalwood+powder&qid=1622846297&sr=83&linkCode=ll1&tag=sandalwood-for-skin&linkId=cc8bb152b6dc6a777b80eaf460125c69&ref_=as_li_ss_tl&ascsubtag=1b2fa4e6-2c9e48bf-b8a632924a37a84b&correlationId= 1b2fa4e6-2c9e-48bf-b8a6-32924a37a84b

119. Pam Herbals Special Sandalwood DIY Powder (n.d.). Amazon.com. https://www.amazon.com/Pam Herbals-Sandalwood-Auspicious occasions/dp/B06XDDP7S4?dchild=1&keywords=sandalwood+powder&qid=1622846233&sr=8- 4&linkCode=ll1&tag=sandalwood-for-skin20&linkId=2ac7c91fd330bb9f7a3b6288de40c43b&ref_=as_li_ss_tl&ascsubtag=b7b760fe-7409-49bebb4d5d42caf6471d&correlationId=b7b760fe-7409-49be-bb4d-5d42caf6471d

120. pureSCRUBS Ultra Moisturizing Sandalwood Body Oil Spray. (n.d.). purescrubs.com. https://purescrubs.com/products/sandalwood-body-oil-ultra-moisturizing premium-blend-10

121. Sindhu, R. K., Upma, K. A., & Arora, S. (2010). Santalum album linn: a review on morphology, phytochemistry and pharmacological aspects. International Journal of PharmTech Research, 2(1), 914-919.

122. Viollon C, Chaumont JP, Antifungal properties of essential oils and their main components upon Cryptococcus neoformans. Mycopathologia, 1994, 128, 151-153.

123. Warnke, P. H., Becker, S. T., Podschun, R., Sivananthan, S., Springer, I. N., Russo, P. A., ... & Sherry, E. (2009). The battle against multi-resistant strains: renaissance of antimicrobial essential oils as a promising force to fight hospital-acquired infections. Journal of Cranio-Maxillofacial Surgery, 37(7), 392-397.

124. Shah, B., Sheth, F., &Parabia, M. (2011). Documenting Grandmas' prescriptions for skin ailments in Valsad district, Gujarat.

125. Moy, R. L., Levenson, C., So, J. J., & Rock, J. A. (2012). Single-center, open-label study of a proprietary topical 0.5% salicylic acid-based treatment regimen containing sandalwood oil in adolescents and adults with mild to moderate acne. Journal of drugs in dermatology: JDD, 11(12), 1403-1408.

126. gbabiaka, T. B., Pittler, M. H., Wider, B., & Ernst, E. (2009). Serenoarepens (saw palmetto). Drug Safety, 32(8), 637–647. https://doi.org/10.2165/00002018-200932080-00003

127. Bianca Rosa Saw Palmetto Cream. (n.d.). NineLife. Retrieved fromhttps://www.ninelife.hu/products/saw-palmetto-101-extract-cream-2-oz-zin-524159-3-pack

128. Yarnell, E., &Abascal, K. (2006). Herbal Medicine for acne vulgaris. Alternative and Complementary Therapies, 12(6), 303–309. https://doi.org/10.1089/act.2006.12.303

129. Beltrami, B., Vassallo, C., Berardesca, E., &Borroni, G. (2001). Antinflammatory, antimicrobial, comedolytic effects of a topical plant complex treatment in acne vulgaris: a clinical trial. Journal of Applied Cosmetology, 19, 11–20.

130. Kumar, S., Mangal, M., Dhawan, A. K., & Singh, N. (2012). Biotechnological advances in jojoba [Simmondsiachinensis (Link) Schneider]: recent developments and prospects for further research. Plant biotechnology reports, 6(2), 97-106

131. EAUTY BY EARTH Hydrating Clay Facial Mask. (n.d.). grove.co. https://www.grove.co/catalog/product/hydrating-clay-facial-mask/

132. NOW Organic Jojoba Oil. (n.d.). grove.co. https://www.grove.co/catalog/product/organic-jojoba oil/

133. Chandra Joshi, B., &Sundriyal, A. (2017). Healing acne with medicinal plants: an overview. Inventi Journals (P) Ltd, 2, 1-13.

134. Pazyar, N., Yaghoobi, R., Ghassemi, M. R., Kazerouni, A., Rafeie, E., &Jamshydian, N. (2013). Jojoba in dermatology: a succinct review. Giornaleitaliano di dermatologia e venereologia: organoufficiale, Societaitaliana di dermatologia e sifilografia, 148(6), 687-691.

135. Reddy, M. P., &Chikara, J. (2010). Biotechnology advances in jojoba (Simmondsiachinensis). In Desert plants (pp. 407-421). Springer, Berlin, Heidelberg.

136. Petrović, G. M., Ilić, M. D., Stankov-Jovanović, V. P., Stojanović, G. S., & Jovanović, S. Č. (2017). Phytochemical analysis of saponaria officinalis L. shoots and Flowers Essential Oils. Natural Product Research, 32(3). https://doi.org/10.1080/14786419.2017.1350668

137. Alana Mitchell Daily OC Cream Cleanser 8oz. Skincare by Alana. (n.d.). Retrieved fromhttps://www.skincarebyalana.com/products/alana-mitchell-daily-oc-cream-cleanser-8oz

138. Juniper & Soapwort gentle cleanser. Great Elm Physick Garden Ltd. (n.d.). Retrieved from https://www.great-elm.com/juniper-soapwort-gentle-cleanser

139. Chandra, S., Rawat, D. S., & Bhatt, A. (2021). Phytochemistry and pharmacological activities of Saponaria officinalis L.: A Review. Notulae Scientia Biologicae, 13(1). https://doi.org/10.15835/nsb13110809

140. Said, O., Khamaysi, I., Kmail, A., Fulder, S., AboFarekh, B., Amin, R., Daraghmeh, J., & Saad, B. (2020). In Vitro and Randomized, Double-Blind, Placebo-Controlled Trial to Determine the Efficacy and Safety of Nine Antiacne Medicinal Plants. Evidence-based complementary and alternative medicine :eCAM, 2020, 3231413. https://doi.org/10.1155/2020/3231413

141. Law S, Lo C, Han J, Leung AW, Xu C. Traditional Chinese Herbal, "Dandelion" and Its Applications on Skin-Care. Trad Integr Med 2021;6(2):152-157

142. Taraxacumofficinale extract. (n.d.). Specialchem.Com. Retrieved June 24, 2022, fromhttps://cosmetics.specialchem.com/inci-ingredients/taraxacum-officinale-extract/c ingredients-anti-acne-agents

143. Dandelion Facial Toner. (n.d.). Floher. Retrieved July 3, 2022, from**https://floher.in/product/dandelion-facial-toner/**

144. Sharma K, Zafar R. Simultaneous estimation of taraxerol and taraxasterol in root callus cultures of Taraxacumofficinale Weber. Int J PharmacognPhytochem Res 2014;6:540-546.

145. Patil, S. M., Ramu, R., Shirahatti, P. S., Shivamallu, C., &Amachawadi, R. G. (2021). A systematic review on ethnopharmacology, phytochemistry and pharmacological aspects of Thymus vulgaris Linn. Heliyon, 7(5), e07054.

146. Thyme Tincture. (n.d.). Herb Pharm. https://www.herb-pharm.com/products/thyme

147. Zu, Y., Yu, H., Liang, L., Fu, Y., Efferth, T., Liu, X., & Wu, N. (2010). Activities of ten essential oils towards Propionibacterium acnes and PC-3, A-549 and MCF-7 cancer cells. Molecules, 15(5), 3200-3210.

148. Dodov, M. G., &Kulevanova, S. (2009). A review of phytotherapy of Acne vulgaris. Macedonian Pharmaceutical Bulletin. UDC: 615.322:616.53-002.

149. Herbal Extract Heartsease EG - Peter Jarvis. (2022). SpecialChem. https://cosmetics.specialchem.com/product/i-peter-jarvis-herbal-extract-heartsease eg

150. Gauttam, V., Munjal, K., & Negi, N. (2018). Bioactivity guided fractionation of potent antiacne plant extract against Propionibacterium acnes. African Journal of Biotechnology, 17(13). https://doi.org/10.5897/AJB2015.14495

151. European Scientific Cooperative OnPhytotherapy. (2009). ESCOP, 2009 Monographs: the Scientific Foundation for Herbal Medicinal Products (2nd Edition). Exeter, U.K. : European Scientific Cooperative on Phytotherapy ; Stuttgart, Germany ; New York : Thieme.

152. Shirbeigi L, Oveidzadeh L, Jafari Z, Motahari Fard M S, Mansouri P. A Review of Acne Etiology and Treatment in Iranian Traditional Medicine. J Skin Stem Cell. 2016;3(1):e39133. doi: 10.5812/jssc.39133.