

## A review on the formulation and evaluation of herbal anti-acne cream

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### Abstract

Acne is a common skin disorder which is common in adolescents and adults. It is a common cutaneous inflammatory disorder of the pilosebaceous unit. It manifests primarily on the face, although it can also affect the upper arms, trunk, and back. Due to hormonal changes 99.5% of teenage boys and 83% of teenage girls are affected by acne which may continue throughout adolescence. Acne causing bacteria are *Propionibacterium acne* and *Staphylococcus epidermidis*. Herbal formulations are receiving more concentration in public because of their high-quality properties and less side effects. Additionally it also provides the skin with necessary nutrients and required moisture. The herbal cream is basically water in oil type of emulsion with fewer side effects. In this paper recently published papers about the formulation of herbal anti-acne cream are reviewed.

**Keywords:** Anti-acne, herbal cream formulation, plant extracts

### Introduction

#### 1. Acne

Acne is a skin disease which causes painful social and psychological effects on sufferers. It is a problem for adults as well as for many teenagers. The primary factors involved in the formation of acne are increased sebum production, sloughing of keratinocytes, bacterial growth and inflammation. *Propionibacterium acnes* (*P. acnes*), an anaerobic pathogen, plays an important role in the pathogenesis of acne by inducing certain inflammatory mediators [1]. The severity of acne can differ significantly from person to person, with genetic factors playing a crucial role. Key contributors to acne include androgen-driven seborrhea, follicular hyperkeratosis, the microbial population, and various immunological and inflammatory processes. These elements interact with one another, shaping the specific acne phenotype observed in each individual [2]. The development of an acne lesion begins with abnormal shedding of the keratinocytes lining the sebaceous follicle, leading to the formation of a microplug or microcomedo. During puberty, increased levels of circulating androgens stimulate sebum production in the pilosebaceous unit. These changes create a favorable environment for the colonization of the commensal bacterium *Propionibacterium acnes*. As *P. acnes* proliferate, they release inflammatory molecules and chemotactic factors that trigger and sustain the local inflammatory response, potentially leading to increased keratinocyte proliferation as well [3].

#### 2. Factors responsible for acne [4]:

- *Propionibacterium acnes* (*P. acnes*)
- Altered follicular keratinization
- Inflammation
- Androgen-induced enhanced sebum hyper-production
- Medications.
- Due to the Cosmetics Used
- Stress
- Hormonal Changes and Menstruation
- Squeezing the Pimples
- Diet

- Genetics
- Over Washing the Face with Cleansers

#### Herbal cosmetics

The term "herbal cosmetics" refers to products that contain more natural elements and have only the objective to give certain cosmetic benefits. The market for herbal medications is growing quickly because they have no side effects that are harmful. The only ingredient in herbal cosmetics is herbs and plants [5]. Herbal cosmetics are utilized more nowadays because of their advantage over the traditional system of medicine.

Formulations such as skin protection, sunscreen, anti-acne, and anti-wrinkle, whether natural or synthetic are available for a variety of skin conditions. When compared to synthetic formulations, herbal medications have no negative effects because of their rich qualities, which include anti-inflammatory, antiseptic, antibacterial, and antioxidant activities [6].

#### 1. Advantages of herbal cosmetics over traditional cosmetics [7]

1. They do not provoke allergic reactions and do not have any negative side effects.
2. They are easily incorporated with skin and hair.
3. These are very effective than other cosmetics with small quantity.
4. Extract form of the plants decreases the bulk properties of the cosmetics and gives appropriate pharmacological effects
5. Easy to available and found in large of variety of plants.
6. They have more stability, purity, efficacy, with their herbal constituents.
7. Easy to manufacture.
8. The storage and handling of herbal cosmetics is easier and for prolong period.

#### 2. Cream

Cream is defined as semisolid emulsions which are oil in water (o/w) or water in oil (w/o) type and these semisolid emulsions are intended for external application. Creams are

used for medicinal or cosmetic functions, as well as for cleansing, beautifying, and improving appearances. These topical formulations are intended to deliver the medication locally, into the mucous membrane or the skin's underlying layer. These items need to be used topically in order to improve the site-specific administration of medication for skin conditions<sup>[8]</sup>. The purpose of the cream is to treat any illness, prevent tan lines and acne, and soothe the skin in response to various environmental conditions. There are various kinds of creams, including foundation, vanishing, cleansing, massage, hand, and body creams. Creams can be applied to any part of the body with ease. It is convenient to use cream by all the age group of people<sup>[9]</sup>.

**2.1. Types of face cream<sup>[9]</sup>:** There are two different kinds of cream:

**2.1.1. Oil-in-water (O/W):** An oil-in-water (O/W) emulsion is one in which the oil is spread as droplets throughout the aqueous phase. Oil-in-Water (O/W) creams are formed of minute droplets of oil dispersed in a continuous phase.

**2.1.2. Water-in-Oil (W/O):** Creams that are made of tiny water droplets scattered throughout an ongoing oily phase are known as "water-in-oil" (W/O) products. The water-in-oil (W/O) kind of emulsion is created when oil serves as both the dispersion medium and the dispersed phase.

## 2.2. Formulation of herbal cream

We have studied various articles from the past few years. From our study we can easily say that the herbal anti acne cream is made up of two parts i.e. Chief constituents and excipients.

### 2.2.1. Chief constituents

These are the main pharmacologically active compounds which will give the cream its anti acne action on our face. In this these are the herbal drugs which are acquired from natural sources. In our study we came across numerous drugs, these are given as follows:-

**Eucalyptus globules:** The leaf of the eucalyptus is used in the formulation of the anti acne cream. The essential oil of eucalyptus show antibacterial activity against wide range of bacteria including *Propionibacterium acnes* (*P.acnes*).<sup>10</sup> after our study we came to the conclusion that it can be used as low as 2%<sup>[10]</sup> and as high as 4%<sup>[11]</sup>.

**Iris ensata:** The extract of iris is used in the formulation of poly-herbal anti-acne cream. It was prepared by using the iris roots in the petroleum ether in ratio (60:80) in the Soxhlet's Apparatus. It is used in the concentration of 1.5%<sup>[11]</sup>.

**Azadirachta indica:** The common name of this drug is neem. It is widely used in India for its anti microbial properties .it is used from the ancient times for its various benefits. It also shows anti bacterial activities against the acne bacteria. For the preparation of the poly herbal anti acne cream its extract is used. It was prepared by using the leaves of the neem in the petroleum ether in ratio (60:80) in the Soxhlet's Apparatus. It can be used as low as 0.5%<sup>[13]</sup> to as high as 5%<sup>[12]</sup>.

**Cyperus rotundus:** it is commonly known as nut grass. *Cyperus rotundus* is native to Africa, southern and central Europe, and southern Asia. It shows properties like anti fungal, anti bacterial and anti microbial which makes it a great cosmetic ingredient<sup>[14]</sup>. Its extract is also prepared by using its roots in the petroleum ether in ratio (60:80) in the Soxhlet's Apparatus. It can be used as low as 1.5%<sup>[11]</sup> to as high as 2%<sup>[14]</sup>.

**Nyctanthes arbortristis:** its local name is Harsinghar .it is used in the Indian traditional system of medicine. It is an excellent anti bacterial agent. It is formulated by using its extract which can be made by using its steam with petroleum ether in the ratio of (60:80). It is used in the concentration of 1.5%<sup>[11]</sup>.

**Astragalus sarcocolla:** its local name is Anjira.it is also a traditional herbal drug .it will improve the health of the skin due to its anti-oxidant property. It was extracted in the alcohol-distilled water in the ratio of (50:50). it is used in the concentration of 1.5%<sup>[11]</sup>.

**Aloe barbadensis:** it is commonly known as Aloe Vera in India. Aloe Vera gel is used as a moisturizer, to reduce pimples and acne and also used for treatment of burn wounds<sup>[13]</sup>. The Aloe Vera is used as the skin glowing agents and soothing effects. Also has antioxidant activity and anti-inflammatory activity<sup>[15]</sup>. The aloe Vera gel that is the colorless parenchymatous tissue was removed using the sterile knife. Then it is filtered using muslin cloth to remove the fibers and impurities.

Then the filtrate or the filter product which is a clear aloe Vera gel may be used in the preparation<sup>[13]</sup>. It can be used as low as 0.63%<sup>[16]</sup> to as high as 3%<sup>[11]</sup>.

**Matricaria chamomilla:** Its drug name is Baboona. In the preparation of poly herbal anti acne cream, it's essential oil is used. The flowers of baboon are used for its preparation. It is used in the conc. Of 0.5%<sup>[11]</sup>.

**Vetiveria zizanooides:** it is used in the preparation of poly herbal anti acne cream. Its local name is Khas. In the preparation its essential oils are extracted and used. It can be used in the conc. Of 0.3%<sup>[11]</sup>.

**Commiphora myrrha:** it is also called Mur-makki. Its essential oil is used for the preparation of poly herbal anti acne cream. It is used for its anti microbial, astringent and anti inflammatory activity. It is used in the conc. Of 0.2%<sup>[11]</sup>.

**Boswellia serrata:** its local name is Gugal/Luban. It is used in the poly herbal anti acne cream for its anti inflammatory property .in the preparations its essential oils are used. It is used in the conc. As low as 0.2%<sup>[11]</sup> to as high as 4%<sup>[18]</sup>.

**Jasminum officinalis:** It is also known as Chameli. It gives a very pleasant odor. It's used as an anti oxidant as well as anti-wrinkle agent in the formulation of poly herbal anti acne cream. Its essential oils are used in small amount. It's used in the conc. Of 0.3%<sup>[11]</sup>.

**Olea europaea:** It's commonly known as Olive as well as Zaitoon in India. It possesses properties like moisturizer and

anti oxidant. Its fixed oil is used in the preparation of poly herbal anti acne cream. It is used in the conc. Of 5% <sup>[11]</sup>, it also works as a supporting agent.

***Salix alba***: It is known as The White Willow. It is a species of willow native to Europe and western and central Asia. In this poly herbal cream preparation the bark of white willow is used. It helps in the exfoliation of skin and promotes new cell growth. It is used in the conc. Of 0.63% <sup>[16]</sup>.

***Saccharum officinarum***: It is known as Sugar Cane .it is high in sucrose. It is also used as an exfoliating agent in the poly herbal cream formulation. It also acts as a supporting role, as an excipient. The juice of sugar cane is used in the conc. Of 0.63% <sup>[16]</sup>.

***Cucumis sativus***: It is commonly known as Cucumber. It provides cooling, healing and soothing to irritated skin, whether caused by sun, or the effects of cutaneous eruption, due to high anti oxidant nature. For the formulation it is prepared by using the fruit of cucumber in the Soxhlet apparatus and extracted with petroleum ether (60 to 80°C) to defat the drug. It is used in the conc. of 1.5% <sup>[14]</sup>.

***Daucus carota***: It is known as wild carrot. It contain abundant amount of Vitamin A and Vitamin C. Vitamin A also acts as a very good antioxidant which slows down the process of aging. Vitamin C produces collagen in the body which is an essential protein for making our skin elastic. It also prevents wrinkles on the skin. It is used in the herbal anti acne cream preparation for its anti oxidant and anti aging property. It is used in the conc. of 0.5% <sup>[19]</sup>.

***Ocimum sanctum***: It is commonly known as Tulsi (Holy basil). Tulsi is mostly used for medicinal purposes and in herbal cosmetics, and is widely used in skin preparations due to its anti-bacterial activity and Decrease dark spots. Tulsi detoxifies the blood, and flushes out toxins from the body. Tulsi contains antioxidants, which neutralize the harmful effects of free radicals, and thus arrests aging. It's used in the formulation for its anti bacterial action against the acne bacteria. It have many benefits for the skin due to its versatility. It's used in the conc. of 0.5% <sup>[19]</sup>.

***Casuarina equisetifolia***: It is an ornamental plant grown in Pakistan, India, tropical Africa and Sri Lanka. This plant possesses antibacterial, antifungal, anti-inflammatory, anti cancerous, antioxidant and analgesic activity. The bark of C. equisetifolia is used as an astringent. It is used in 5% <sup>[20]</sup>.

***Cinnamomum verum***: It is also called cinnamon in common language. In unani preparation it's called Darchini .it is used for its primary action, Antiseptic. It's used in preparation of herbal anti acne cream. It is used in the conc. Of 1% <sup>[21]</sup>.

***Rubia cordifolia***: It is known as Manjishtha, is a species of flowering plant in the coffee family, Rubiaceae. It is called Husune Yusuf in unani herbal classification. It is used for its anti inflammatory and anti bacterial action. It is used in the preparation in conc. as low as 0.3%<sup>15</sup> to as high as 1% <sup>[21]</sup>.

***Papaver somniferum***: These are the seeds of Papaver somniferum belonging to the family Papaveraceae. It is

called Tukhm Khashkhash in unani formulation. It is used for its anti bacterial action .it is used in the formulation in conc. Of 1% <sup>[21]</sup>.

***Brassica oleracea***: It is known as Cauliflower. It mainly contains several phytochemicals, common in the cabbage family, that are under preliminary research for their potential properties, including isothiocyanates and glucosinolates. It have property likes anti inflammatory and it also protect the face from UV radiation. It is used in the conc. of 0.9% <sup>[22]</sup>.

***Catharanthus roseus***: It is called vinca. The formulation uses the flower of the vinca in herbal anti acne cream formulation. It have properties like Astringent, Disinfectant and Anti bacterial which are useful in treating the acne. It is used in the conc. of 0.9% <sup>[22]</sup>.

***Ocimum basilicum***: It is commonly called Basil. It possesses properties like anti bacterial and anti inflammatory which are useful against the acne causing bacteria. Basil is native to tropical regions from Central Africa to Southeast Asia <sup>[17]</sup>.

***Thymus vulgaris***: It is commonly known as Thyme. It possesses properties like anti fungal, anti bacterial and anti inflammatory which are useful in poly herbal anti acne cream formulation. It is native to southern Europe from the western Mediterranean to southern Italy <sup>[17]</sup>.

***Foeniculum vulgare***: Its common name is fennel. It have Good anti microbial, anti-oxidant and anti-inflammatory activity. It is originated in the southern Mediterranean region. Romans grew it for its aromatic seeds. It is used in the formulation of herbal anti acne cream. It's used in the conc. of 1% <sup>[23]</sup>.

***Camellia sinensis***: Camellia sinensis is a species of evergreen shrub or small tree in the flowering plant family Theaceae. Its leaves, leaf buds, and stems can be used to produce tea. It is known as Green Tea. It have ant melanogenesis, moisture retention, and skin-protecting properties. These properties have made it an ideal candidate to use in the formulation of herbal anti acne cream along with other drugs. It is used in the conc. of 10% <sup>[24]</sup>.

### 2.2.2. Excipients

Excipient is a substance included alongside the active ingredient of a medication. Excipients serve various purposes, including long-term stabilization, bulking up solid formulations containing potent active ingredients in small amounts, or enhancing the therapeutic properties of the active ingredient in the final dosage form. They can facilitate drug absorption, reduce viscosity, or enhance solubility. The excipients are selected depending upon the properties of the selected required excipient. After analyzing the formulation of the newly published research articles. We observed that the main contribution of excipient in ultimate formulation decides its inclusion or exclusion in the formula.

**a. Thickening agents:** A thickening agent or thickener is a substance which can increase the viscosity of a liquid without substantially changing its other properties. E.g.-

1. Steric acid- We found that almost 35 to 36% formulation include steric acid in their formulation
2. Carbopol 940- Only one of the formulation used carbopol940 in their formulation <sup>[10]</sup>.
3. PEG1500-This is also used in one of the formulation as a thickening agent <sup>[10]</sup>.
4. Cetyl alcohol-From our survey it was evident that it was not popular as compared to steric acid but it was still used in 30-32% formulations.

From these facts we studied that steric acid is used more than any other agents. So, we can safely say that is a good thickening agent as compared to other drugs. It is also a good binder. It is used in conc. as low as 3% <sup>[12]</sup> to as high as 16.22% <sup>[16]</sup>.

**b. Anti-Inflammatory Agents:** These are substances that reduce inflammation (redness, swelling, and pain) in the body. Anti-inflammatory agents block certain substances in the body that cause inflammation. These excipients also enhance the anti inflammatory activity of the Chief ingredients. E.g.-

1. Spermaceti- It was observed in only one of the formulation as a anti inflammatory agent <sup>[10]</sup>.
2. Almond oil- It was found that almost 35 to 36% of the formulation included this in their formulation
3. White bees wax- This was very popular as about 42 to 45% of the formulations are made using this excipient.
4. Salicylic acid- It was surveyed in our study that only one of the formulation used this salicylic acid <sup>[24]</sup>.
5. Castor oil- This was also included only by one of the formulation in our study <sup>[24]</sup>.

From these facts we studied that white bees wax is an optimum Anti-inflammatory agent due to its versatility. It's used in the range of conc. of 1.6% <sup>15</sup> to 16.67% <sup>[18]</sup>.

**c. Moisturizing Agent:** Moisturizing agents are added to cosmetics to prevent any loss of moisture and hydrate the skin. They help in retaining the inherent moisture and give a smooth appearance to the skin. These include humectants, occlusives, and emollients. E.g.-

1. Glycerylmonosterate- It was observed that only one of the formulation used this in their formula <sup>[10]</sup>.
2. White petroleum- It was found that this is also used in only one formulation as a moisturizing agent in combination with other moisturizing agent <sup>[10]</sup>.
3. PEG1500- It is also used to enhance others moisturizing property and make the formulation better <sup>[10]</sup>.
4. Silicone oil- It was rarely used in the formulation but it was used with the other agents to synergies the effect of the other agents <sup>[10]</sup>.
5. Glycerin- It was observed that it was a great moisturizing agent and very popular as it was used in almost 50% of the formulations form our study.
6. White bees wax- This was very popular as about 42 to 45% of the formulations are made using this excipient.
7. Ammonium acryloyldimethyltaurate- It was found to be used in only one of the formulation from our study <sup>[25]</sup>.
8. Petroleum jelly- It was also used by one of the formulation from our study <sup>[11]</sup>.
9. Mineral oil- It was found in only one of the formulation <sup>[18]</sup>.
10. Propylene glycol- It was observed that propylene glycol is fairly used as it was used in about 25% of the formulation.

11. Isopropyl Myristate- This was observed to be used in only one of the formulation in our study <sup>[16]</sup>.
12. Vitamin E (Tocopherol)- This is found to be used in one of the formulation from our study <sup>[16]</sup>.
13. Cetomacrogol- It was seen from the ongoing survey that it was used in only one formulation <sup>[20]</sup>.
14. White soft paraffin- This is only used by one of the formulation in our survey <sup>[21]</sup>.
15. Polyethylene glycol- Lastly this is also observed to be used in only one of the formulation <sup>[12]</sup>.

From our study of these facts, we can say that Glycerin can be a suitable candidate for moisturizer in our herbal anti acne cream formulation. The Glycerin shows the best moisturizing capabilities while having lower side effects and other drug interaction. It can be used in the range of conc. as low as 1.9% <sup>[16]</sup> and as high as 12% <sup>[21]</sup>.

**d. Antioxidants:** Antioxidants are compounds that inhibit oxidation. A chemical reaction that can produce free radicals. The presence of these free radicals will lead to the spoilage or herbal compounds and will eventually affect the shelf life of the product. The antioxidants will protect the active ingredients in drug by reacting with oxygen before the active ingredients. E.g.-

1. Citric acid- This is found to be used in one of the formulation in our study <sup>[10]</sup>.
2. Sodium metabisulfite- This is also observed to be used in one formula in the formulations studied <sup>[10]</sup>.
3. Zinc oxide- It was seen to be used more than other agents, as it was used in two of the formulation <sup>[11, 16]</sup>.

From our study of these facts, we can safely say that zinc oxide can be used as an ideal candidate for antioxidants. Meanwhile, Mint will show multiple properties such as astringent and will provide freshness to the cream. Zinc oxide is used in multiple preparations as an antioxidant. It can be used in the conc. as low as 0.76% <sup>[16]</sup> to as high as 1.5% <sup>[11]</sup>.

**e. Buffering agent:** A buffer is a solution that can resist pH change upon the addition of acidic or basic components. It is able to neutralize small amounts of added acid or base, thus maintaining the pH of the solution relatively stable. These agents are used to maintain the preparation stable in various conditions. E.g.-

1. Sodium citrate- It was seen to be used in one of the formulation in our study <sup>[10]</sup>.
2. Potassium hydroxide- From our study we can safely say that it can be used fairly as a buffering agent. As it was used in 3 of the formulations <sup>[11, 17, 24]</sup>.
3. Triethanolamine- From our survey of these formulations we can say that the triethanolamine is a great buffering agent which is also used mostly. As it was used in about 36 to 38% of the formulations.
4. Borax- It is not as popular as triethanolamine but the borax is fairly used in the formulation as a buffering agent. It was used in about 30 to 32% of them
5. EDTA- This was seen to be used in only one of the formulation <sup>[20]</sup>.

From our study of these facts, we can safely say that Triethanolamine can be used as a buffering agent, as it is

more versatile and easy to use and find. Triethanolamine is used in multiple formulations in our study and its conc. can vary from as low as 0.5% <sup>[16]</sup> to as high as 2% <sup>[12]</sup>.

**f. Preservative:** These are those compounds or drugs which will help in stopping the spoilage of our preparation. These agents will prevent the decomposition by microbial growth. E.g.-

1. Methyl paraben- It was observed that almost 80% of the anti acne cream includes methyl paraben as a preservative.
2. Propyl paraben- It was seen from the ongoing survey that propyl paraben is included as a secondary preservative in about 55 to 60 % of the formulation.
3. Borax- Form evaluation of the formulation the fact becomes clear that borax is incorporated as a supporting preservative along with either methyl paraben or propyl paraben in 30 to 32% of the formulation.
4. Disodium EDTA- It was seen from the survey that only one of the formulation included this as a preservative <sup>[25]</sup>.
5. EDTA- It was analyzed that this was also used in one of the formulation as a preservative <sup>[20]</sup>.

From our study of these facts, we can safely say that both methyl paraben and propyl paraben are great preservatives, which can be easily incorporated into most formulations. Methyl paraben is used in multiple articles. It can be used in conc. as low as 0.01% <sup>[14]</sup> to as high as 0.6% <sup>[25]</sup>.

**g. Skin protectant:** Skin protectant is a thin barrier or layer which can be applied to damage skin or to skin which is at risk of damage. The protectant provides a protective layer on the skin and enhances the healing process as well as protects the wounded skin. E.g.-

1. Mineral oil- From our observation we found that it is also used as a moisturizing agent but this was only used in one formulation as a skin protectant <sup>[18]</sup>.
2. Zinc oxide- It was found that zinc oxide is a good skin protectant. In our study we discovered that this was only used twice in the formulations. <sup>[11, 16]</sup>
3. Lanolin-Lanolin is also a good skin protectant. It can also be used with zinc oxide in the formulation. It is used twice in our study. <sup>[11, 22]</sup>
4. Bismuth subnitrate- This is used one time in our whole study in a single formulation <sup>[16]</sup>.
5. Ammonium acryloyldimethyltaurate- It was seen that this is also used only once in our study <sup>[25]</sup>.

From our study of these facts, we can say that both the zinc oxide and Lanolin will provide a protective layer and will also speed up the healing process. Lanolin can be used in the conc. as low as 2% <sup>[11]</sup> and as high as 4.3% <sup>[22]</sup>.

**h. Emulsifier:** Emulsifiers are surface-active agents which mean that they float within the interfaces between aqueous and oily phases and thus form links - the essential precondition for emulsifiers. These agents will allow the formulation of emulsion. E.g.-

1. Cetostearyl alcohol- It was discovered that it is not that popular as it was only used a single time in our formulation.
2. Cetyl alcohol- It was seen that this is used very frequently as it is used 30 to 35% of the formulations.

3. Borax- It was also used as much as cetyl alcohol in our formulations. It is a good emulsifying agent. Used in about 30 to 35% of the formulations.
4. Sodium lauryl sulfate- It was observed that it is used in only one of the formulation from our study <sup>[12]</sup>.
5. Tween60- It was seen in only one of the formulation in our study <sup>[20]</sup>.
6. Polysorbate- From our study we find that it is only used once in our formulation survey <sup>[21]</sup>.
7. Polyethylene glycol- It was observed to be used single time in our study of the formulations <sup>[12]</sup>.

From our study of these facts, we can safely say that both Borax and Cetyl alcohol is a good emulsifying agent. Borax can be used as low as 0.1% <sup>[15]</sup> to as high as 0.8% <sup>[18]</sup> While Cetyl alcohol can be used as low as 0.95% <sup>[16]</sup> to as high as 5.8% <sup>[21]</sup>.

**i. Antimicrobial Agent:** Antimicrobial preservatives have a double function: (i) to prevent the proliferation of microorganisms leading to deterioration of the product, and (ii) to prevent the growth of pathogenic microorganisms that may pose a potential health risk to the user during their repeated use, often by multiple persons, over extended periods of time. This includes antibacterial as well as antifungal actions. E.g.

1. White bees wax- From our study we observe that it have great anti microbial activity and is most popular anti microbial agent which is used in almost 42 to 45% of the formulation.
2. Sulfur- It was observed that it is used only once in our formulation study <sup>[16]</sup>.
3. Castor oil- It was found that castor oil is used only one time in our study. As a anti microbial agent <sup>[24]</sup>.

From our study of these facts, we can safely say that White bees wax have great antimicrobial activity. It especially shows a good antibacterial activity, which can prolong the life span of the preparation. It is used in multiple articles. It can have its conc. as low as 1.6% <sup>[15]</sup> to as high as 16.67% <sup>[18]</sup>.

**j. Exfoliating agents:** Exfoliating agents are ingredients used in cosmetic products to remove dead skin cells from the surface of the skin through a technique known as exfoliation. Exfoliation assists your skin's natural cell turnover process. This process begins in the deepest layer of the epidermis where fresh cells are 'born'. These young, springy cells travel up through the other layers of the epidermis until they reach the skin's surface. E.g.- Derma soft <sup>[16]</sup>, Beta hydroxyl acids(BHA) <sup>[21]</sup> or Salicylic acid <sup>[24]</sup>

From our study of these facts, we found that these agents were used in single articles. All of these agents show good exfoliating action on the skin. These can be used in concentrations of,

1. Dermasoft is used in the conc. of 1.90% <sup>[16]</sup>.
2. BHA is used in the conc. of 0.02% <sup>[21]</sup>.
3. Salicylic acid is used in the conc. of 3% <sup>[24]</sup>.

**k. Fragrance Agents:** These are those agents which will provide a pleasant odor from the formulation. Although the amount of fragrance used in cosmetics is small, it is an essential ingredient in cosmetics. E.g.-

### 1. Rose water

- It is a very good fragrance agent which is used moderately in our formulation in about 30 to 32% of them.

### 2. Min:

- It is not that widely used in our formulation study. As it is used in a singular formulation <sup>[12]</sup>.

From our study of these facts, we find that rose water and mint is good for providing fragrance to the formulation. Rose water also provides anti-ageing property to the skin. As they are fragrance provider they are generally used in drops according to the need.

### 2.3. Evaluation tests for cream

From the analysis of the formulations included in current study, it was observed that these evaluation tests are used frequently and are most commonly performed to ensure a stable, safe and effective product.

**Ph of cream** <sup>[15, 19]</sup>: The pH meter is calibrated using standard buffer solution. About 0.5 g of the cream is to be weighed and dissolved in 50.0 ml of distilled water and its pH is measured. The pH of the cream should in range 5.6-5.8, to avoid irritancy to the skin

**Viscosity** <sup>[19]</sup>: Viscosity of the formulation may be determined by Brookfield Viscometer at 100 rpm, using spindle no 7.

**Dye test** <sup>[19]</sup>: Scarlet red dye is mixed with the cream. A drop of the cream is placed on a microscopic slide covering it with a cover slip, and is examined under a microscope. If dispersed globules appear red and the ground colorless, the cream may be o/w type. The reverse condition occurs in w/o type cream i.e. the disperse globules appear colorless in the red ground.

**Homogeneity** <sup>[22]</sup>: These formulations must be produce uniform distribution of the extracts in the cream. This was confirmed by visual appearance and by touch.

**Physical Evaluation** <sup>[15]</sup>: The physical parameters of cream like colour, odor, consistency, and state of formulation are tested for further evaluation of the formulation.

**After feel** <sup>[12]</sup>: Emolliency, slipperiness and amount of residue left after the application of fixed amount of cream are to be checked.

**Washability** <sup>[13]</sup>: On the hand, a little amount of cream was applied and washing it with tap water.

**Phase Separation** <sup>[13]</sup>: Prepared cream is kept in a closed container at a temperature of 25-100°C away from light. Then phase separation is checked every 24 hours for 30 days. Any change in the phase separation is observed.

**Type of smear** <sup>[12]</sup>: After application of cream, the type of film or smear formed on the skin were checked.

**Acid value** <sup>[19]</sup>: 10 gm of substance dissolved, in 50 ml mixture of equal volume of alcohol and solvent ether, the

flask is connected to reflux condenser and slowly heated, until sample is dissolved completely, to this 1 ml of phenolphthalein is added and titrated with 0.1N NaOH, until faintly pink color appears after shaking for 30 seconds.

$$\text{Acid value} = n \times 5.61/w$$

n = the number of ml of NaOH required.

w = the weight of substance.

**Saponification value** <sup>[19]</sup>: Introduce about 2 gm of substance refluxed with 25 ml of 0.5 N alcoholic KOH for 30 minutes, to this 1 ml of phenolphthalein added and titrated immediately, with 0.5 N HCL.

$$\text{Saponification value} = (b-a) \times 28.05/w$$

The volume in ml of titrant = a

The volume in ml of titrate = b

The weight of substance in gm = w

**Irritancy test** <sup>[15]</sup>: These tests are used to determine the quality of the material and the chemicals, as well as whether or not they are damaging to the skin. The cream is initially applied to the hand and left on for a while so that we can check for irritation. Mark an area (1sq.cm) on the left hand dorsal surface. The cream is applied to the specified area and time is noted. Irritancy, erythema, edema, is checked if any for regular intervals up to 24 hrs and reported.

### Accelerated stability testing <sup>[19]</sup>

Accelerated stability testing of prepared formulations is conducted for 2 most stable formulations at room temperature, studied for 7 days at 40°C ± 1°C for 20 days. The formulations are kept both at room and elevated temperature and observed on 0th, 5th, 10th, 15th and 20th day for stability parameters.

### Conclusions

After a thorough review of the articles in our study, we concluded that the herbal anti-acne cream is a highly effective formulation with minimal side effects. Our research explored various natural herbs used in the formulation of anti-acne creams, their evaluation methods, and the concentrations of the herbs employed. The aim of our study is to provide detailed information about the different herbs and excipients incorporated into the herbal anti-acne cream.

The evaluation parameters can be evaluated so as to determine the stability, safety and efficacy of a herbal anti-acne cream.

After our study we arrived on a general formulation of the anti acne cream. This is a mere suggestive in nature and we have tried to establish range of each and every ingredient so that one can begin his or her work by designing a formula at random and later on accompanied by optimization technique, one can arrive at the best fit formulation.

We are of the opinion that by reviewing large number of formulations of any dosage form one can arrive at average share of ingredients in order to design a formula for establishing an optimum formulation.

**Table 1:** General formula of anti acne cream on the basis of present study

S N	Ingredients	Percentage used	Description
1	Primary Herbs	0.5%-10%	These are used primarily for their activity against the acne. E.g.- aloe, vinca, neem, fennel etc.
2	Secondary Herbs	0.5%-5%	These are used to compliment the Primary herbs properties against the acne. These includes E.g.- thyme, cauliflower, almond oil etc
3	Support Herbs	0.5%-5%	These are used to support the primary and secondary herbs properties or to give the formulation additional properties. E.g.- sugarcane, zayton, olive etc
4	Thickening agents	2%-16.5%	These are used to inc. the viscosity of the liquid. E.g.- steric acid, carbopol940, Cetyl alcohol etc.
5	Anti-Inflammatory Agents	1%-16.5%	These substances reduce the inflammation in the body. E.g.-almond oil, castor oil, bees wax etc.
6	Moisturizing Agent	1%-15%	These help in retaining the inherent moisture and hydrate the skin. E.g.-glycerin ,white bees wax, vitamin E etc.
7	Antioxidants	0.5%-2%	These are used to inhibit the oxidation. E.g.-citric acid, zinc oxide, mint etc.
8	Buffering agent	0.5%-2%	These are used to maintain the pH of the solution relatively stable. E.g.- borax, sodium citrate, triethanolamine etc
9	Preservative	0.01%-1%	These are used in stopping the spoilage of our preparation. E.g.- methyl paraben, propyl paraben, borax etc
10	Skin protectant	0.5%-5%	These provide a protective layer on the skin. E.g.- lanolin, zinc oxide, mineral oil etc
11	Emulsifier	0.1%-6%	These help in the formulation of cream. Which allow mixing of two different phases. E.g.-polysorbate, tween 60, Cetyl alcohol etc.
12	Antimicrobial Agent	1-17%	These are used to prevent the growth of pathogenic microorganisms. E.g.- sulfur, castor oil, white bees wax etc
13	Exfoliating agents	0.01%-3%	These are used to remove dead skin cells from the surface of the skin E.g.- Derma soft, B.H.A, Salicylic acid etc
14	Fragrance Agents	Used in drops as per use	These are used to provide a pleasant odor in the formulation. E.g.- rose water, mint etc.

We can use this general formulation for future preparation. This will shorten the time require in the formulation. With this we have successfully completed the survey of the research articles.

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