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REVIEW ON FORMULATION AND EVALUATION OF ANTI-ACNE CONCEALER

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Abstract

Acne is a chronic inflammatory skin disorder that involves the pilosebaceousgland. It is a common universal disease affecting about 85% of adolescents. Acne is a socially distressing skin condition created by *propionibacterium acne*, which has generally been treated with antibiotics. In the previous reported researches and review study, many types of concealer were prepared and used against acne and dermatitis to treat them. A concealer, a color corrector, is a cosmetic product that masks skin imperfections. These imperfections include dark circles under the eyes, blemishes, and hyperpigmentation. The formulation of medicated concealer, which includes dimethicone, Kojicdipalmitate, magnesium aluminum silicate, and propylene glycol, was carried out. The ingredients used in the preparation of cosmetics with their desirable properties to enhance the quality of the product in such a waythat they have the properties of good penetration, control release of medicament, maintain good compatibility of the active ingredients with other excipients, product stability in different conditions and provide better skin protection from sun rays. The concealer contains qualities like moisturizing, conditioning, emollient effects, anti-bacterial properties, etc., typically used to treat acne. This review includes types of acne, factors responsible, and common contents included in the concealer with their properties.

***Keywords**: Propionobacterium acne, concealer, dimethicone, pilobaceous, cosmetic.*

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INTRODUCTION

The medicated concealer as a drug delivery system has developed faster than topical drug delivery systems. Many topical formulations, such as ointments, creams, gels, etc., are available in the market and are used to mask dark circles, pimples, etc. [1]. The skin care preparations include a wide range of products for external application intended to cleanse, deodorant, or, more generally, keep oneself in good condition in the areas of the body to which they are applied. People utilize a wide range of cosmetic products to improve their lifestyles; persons generally show the quality of daily use of cosmetics to maintain their beauty and healthiness [2]. Products like toothpaste, sunscreen, talc, mouthwash, lip concealers, complexion creams, foot powdersetc, in the hope of developing a charming personality, protecting their bodies, and avoiding foul smell [3]. The present work aims to develop an anti-acne concealer.

In previous studies, many types of concealer were formulated for acne with various ingredients; for activity against Propionibacteriumacne and acne vulgaris, and the essential oils showed antibacterial activity, but not all essential oils have this efficiency. Aiterature survey found that cinnamon, jojoba, and castor oil are used in anti-acne concealer formulations. The underlying pathogenesis of these lesions is multifactorial and includes high sebum secretion, hyper keratinization, hormonal changes, and bacterial infection [5]. Propionibacterium acnes plays a significant role in the pathogenesis of acne. This bacterium can activate certain inflammatory chemical mediators and metabolize sebaceous triglycerides into fatty acids, which attract white blood cells to the plugged follicle, leading to skin inflammation [3, 6]. The previous study examined herbal plants traditionally used as antimicrobial and anti-inflammatory agents against microorganisms frequently involved in acne inflammation, such as Propionibacterium acnes, Staphylococcus epidermidis, and Staphylococcus aureus, acne vulgaris 11.During puberty, the 5-alpha reductase enzyme converts testosterone into more

potent DHT, which binds to specific receptors in the sebaceous glands and increases sebum secretion.
Sebum is retained due to the increased hyper proliferation of the follicular epidermis caused by this [7]. Herbal therapy for acne has been encouraged due to the advantages of better patient tolerance, long history of use, fewer side effects, and being relatively more cost-effective. Many herbs with a history of use in traditional cultures have entered the growing 'cosmeceuticals' market. The efficacy of herbs used in acne treatment is due to their antibacterial activity and their influence on sebum activity, inflammation, and hyperkeratinization associated with acne [8]. Concealers come in different forms, such as liquid, cream concealer, pencil, and powder. Concealer is available in a variety of shades. When picking a concealer, people choose one or two shades lighter than their skin tone to hide their blemishes and dark circles under the eye.
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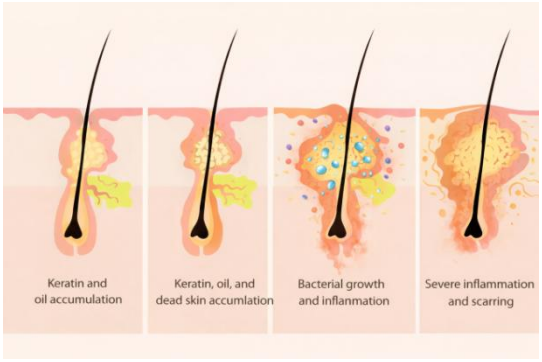

Fig. 01. Steps of acne formation16

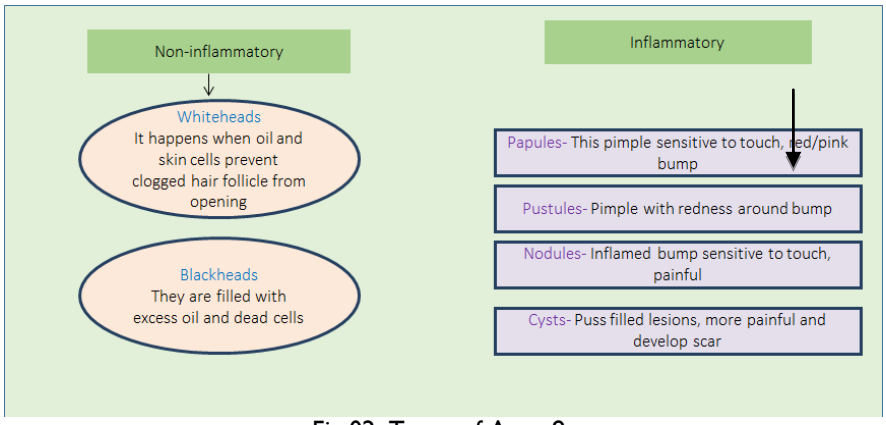

Fig 02. Types of Acne 9

In the following images, types of acne (Figures 02 and 04) [9] are listed mainly non-inflammatory acne (whiteheads and blackheads) and inflammatory acne (papules, Pustules, Nodules, Cysts) [10]. Classification of acne based on severity is explained in table-1 [11-15].

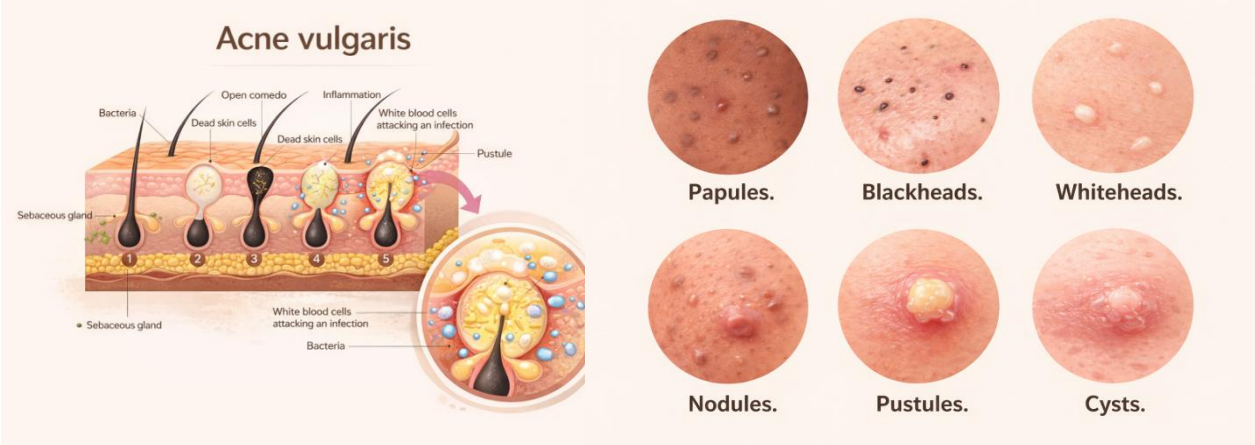

Fig 03: Antibiotic and microphage attacking bacteria11

Fig 04: Type of acne lesions [9]

Table 01. Classification of acne based on severity15

Classification of acne	
Mild	The comedones are non-inflammatory, with fewer pimples on the face and fewer inflammatory lesions.
Moderate	More comedones number and increase number of pimples on the face with less painful
Moderately severe	There are many more comedones and deep inflammatory lesions, which are sensitive. These lesions are spread toward the face, neck, and back.
Severe	The inflammatory lesions convert into cyst form, which is painful and causes small abscesses and swelling in the surrounding cyst.

1. TYPES OF CONCEALER

1.1 Liquid concealer

It is available in squeezable tubes, cylindrical tubes, or square tubes. Liquid concealer is the most popular because it is commercially suitable for many skin types. This concealer also works well for acne spots because it will not bunch up around the acne or settle into the scars. It is best suited for all skin types, including dry, oily, and combination. It's lighter in consistency making it an extremely versatile choice. Liquid concealer leaves a satin, radiant shimmer or matte finish on the skin. A satin finish may look more natural on dry skin [1, 12].

1.2 Stick concealer

Sticks are highly pigmented, making them great for covering up blemishes and imperfections.It leaves a matte or satin finish; both are long-lasting and will not crack or bleed. Stick concealer is used for very specific purposes because it is thicker than liquid and contains a lot of coverage. This concealer type is also very convenient because of the packaging and its ability to be used for touch ups. This concealer works best on blemishes and small areas of discoloration. The formula is very creamy and blends easily into the skin, allowing for flawless daily touch-ups. Best suited for normal, dry, or sensitive skin.Prefered for Acne spots, discoloration, and dark circles [12].

1.3 Cream concealers

These are available in a small pot or palette, leaving a satin or cream finish on the skin. The cream has a thick texture with an opaque pigment. This concealer type is similar to the stick concealer because it offers heavy coverage. It is applied on the skin with a brush due to intense pigmentation. Since they have a thicker consistency they are a good choice for hiding discoloration and spot concealing. It is perfect for acne spots and scars. They fall in between liquid and concealer concealers.

1.4 Pencil concealer

Pencil concealer is manufactured in cream or wax forms. This type of concealer can be used to cover up small blemishes. It has precise tips that perfectly touch up dark circles under the eyes, highlighting the brow. It may also be used to define the shape of the eyebrows or line the inner lash line to brighten the appearance of the eyes [13].

1.5 Cream-to-powder concealer

Available in a powder compact/concealer. It is designed and prepared for oily and acne skin and instantly correct color. Apply with a sponge for a powdery, matte finish. It has no irritation to the skin, absorbs impurities, and makes skin nourishment.

1.6 Causating factors

Following are some factors mentioned that caused the acne. The primary causes are bacterium *Propionibacterium acnes*, increased follicular keratinization, inflammation at the bump, increased sebum secretion, antibiotics therapy, Stress, Hormonal Changes and Menstruation, Squeezing the Pimples, altered Diet plan, Genetics due to skin cleansers [10].

1.7 Pathogenesis of acne

The progression of acne can start from exposure to any causative factors. See the progression of acne in Figure 1.16 Genetically increasing the level of circulating androgen can directly affect the enlargement of the sebaceous glands and the hypersecretion of sebum. Hypersecretion causes the philosebaceous duct's blockage and promotes propionibacterium acne's growth to form comedones. These comedones form the inflammatory papules; when this sebum ruptures into the dermis layer of skin, it activates and produces certain inflammatory mediators like cytokines, etc., stimulating protease production and hydrolysis of lipids into pro-inflammatory fatty acids. Implies the formation of pimples [14, 15].

The present review considered the literature published from 2017 to 2023 on formulation and evaluation of antiacneconcealer .Literature available in databases such as Google Scholar and PubMed was reviewed. This review only considered peer-reviewed research papers. The search terms were Acne vulgaris, acne, anti-acne, C. acnes, skin diseases, formulation and evaluation.

1.8 Formulation consideration for the concealer

The preparation of stable emulsion concealer were formulated for viscous texture, good coverage, and spreadability with anti-propionobacterium acne. Thedimethicone, wax, pigments, and distilled water were alsooptimized [10, 12]. Titanium dioxide and pigments were uniformly blended and then mixed with the mixture of various dimethicone during the formulation. Kojicdipalmitate was dissolved in mineral oil, and waxes were mixed with the dimethicone mixture before heating to 70°C8. Magnesium aluminum silicate and propylene glycol were mixed in water and heated to 75°C. Emulsification was achieved by homogenization at 3500rpm and volatile oil was added after the preparation had cooled down [6,17,24].

Some common ingredients and their properties found in all concealer products are 4, 6, 24

- Castor seed oil, cinnamon oil, or essential oils
- Dimethicone (Emollient)
- Glycerin (Humectant)
- Talc (Hygroscopic)
- Kaolin (Oil absorbent)
- Mineral oil (Moisturizer)
- Hydrolyzed corn starch (Skin softener)
- Oleyl alcohol (Preservative)
- Sodium chloride (Thickener, Preservatives)
- Fragrance
- Color additive
- Water (Diluent)
- Hydrolyzed rice protein (Moisturizer)
- Beeswax (Stiffening agents)
- Glyceryl stearate (Conditioning agent)

2. EVALUATION CONSIDERATION FOR CONCEALER

2.1 Determination of the type of emulsion

A scarlet red dye was mixed with the cream. A drop of the cream was placed on a microscopic slide and examined under a microscope. If the dispersed globules appear red, the continuous phase is colorless, and the cream is oil in water (o/w) type. The reverse condition occurs in water in oil (w/o) type cream [18].

2.2 Organoleptic evaluation

The appearance of finished products was carefully inspected for patient compliance, and the physical appearance should be good looking, such as color and odor, was examined by organoleptic20.

2.3 pH of formulation

The measurement and maintenance of pH is the most important parameter for every dosage formulation. It is done by using a digital pH meter. Initially, it was calibrated using a standard buffer solution. About 1% of the emulsion solution was dissolved in 10 ml of distilled water, and its pH was measured [8, 10, 21].

2.4 Viscosity

The consistency of any formulation requires desirable stability and appropriate flow characteristics to be attained. The relationship between formulation and continuous phase should be linear. The greater the apparent viscosity, the greater the internal phase volume.About 10 ml of formulated sample was checked on a digital viscometer (Brookfield viscometer) [14, 22].

2.5 Wash ability

The washability of any topical preparation is an important parameter to avoid harmful effects on the skin; it needs to be not so greasy. The formulation applied on the skin, shouldhavethe ease and extent of washing with water.

2.6 Skin irritation test

The preparation (0.25 g) on the back of the right hand by the volunteers was applied and left for 60 minutes, then changes in skin color were observed. Applied concealers were covered with sterile pads for 24 hrs., then observed again. Primary irritation will be shown by the skin reaction immediately after use, whereas secondary irritation will be shown a few hours after usage [17].

2.7 Spreadability testing

The spreadability is determined by using a spreadability testing apparatus. It consists of a wooden block provided by a pulley at one end. This method measured spreadability based on 'slip' and 'drag' placed on the ground slide. The preparation was sandwiched between the slide load of 1 kg and kept on a slab so that the preparation would get spread without air bubbles; the excess concealer was scraped off. Later on, 20 kg of standard weight was placed in a pulley with the help of string attached to a hook, and the time required to move till the end will be noted, and the length of the spread concealer will also be noted [17].

Spreadability was then calculated by using the formula S= M x L/T.

Where,

S = spreadability.

L = length moved by a glass slide.

M = weight in the pan.

T= time taken to separate the slides from each other

2.8 Stability study

The stability of formulation is concerned with understanding storage conditions on shelf life, which include temperature, humidity, and radiation. The general condition for evaluation of formulation is compliance with the ICH guidelines. The stability study need to be carried out by storing concealer at three different temperatures, which are 8°C, 27°C, and 40°C for 1 month [18,25].

3. CONCLUSION

The present study aims to review the basic formulation and evaluation process of an anti-acne concealer (medicated) that contains certain essential oils or plant products with good anti-microbial activity. ..This review gives an overview of formulation and evaluation of anti acne concealer which gives an idea of formulating the same for its intended purpose.

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5. AUTHORS CONTRIBUTION STATEMENT

Ajay Dongarwar, Pralay Barhewar, and Rahul Chaudhari designed this review, including collection of data required for article fulfilment, and Priti Neware and Priyanka Raut prepared the manuscript. All authors studied the prepared manuscript and approved.

6. CONFLICT OF INTEREST

Conflict of interest declared none.

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