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Formulation and Evaluation of Polyherbal Emulgel for Treatment of Acne

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ABSTRACT

Skin disease is a persistent inflammatory skin disorder that affects around 70% of teenage females throughout puberty. To counteract this problem, antibiotics are being administered more often, which has resulted in a variety of undesirable side effects. As a result, as a first-line topical therapy, it must target on the herbal formulation. In this study, medicinal plant extracts and oils with high antibacterial activity, such as *Curcuma longa* and *Aloe barbadensis*, tea tree oil, and lemongrass oil, were chosen to produce a polyherbal emulgel for the treatment of acne vulgaris. *Curcuma longa*, *Aloe barbadensis*, tea tree oil, and lemongrass oil were all extracted and reported in this study. Lemongrass oil, tea tree oil, aloe Vera extract, and turmeric extract were used in various amounts in the topical gels. After being kept at room temperature for 24 hours, the gel was prepared and evaluated. As a result of the study's findings, a prepared polyherbal emulgel containing extracts of *Curcuma longa*, lemon grass oil and tea tree oil at concentrations of 0.5 percent, 5 percent, 5 percent respectively, can be used to treat acne vulgaris.

Keywords: Polyherbal emulgel, Anti-acne formulation, Acne vulgaris, *Curcuma longa*, lemongrass oil, tea tree oil

1. INTRODUCTION

Skin is also known as integumentary system. Skin is the broad area and organ of the body, basically it completely covers the body and is continuous with membranes lining the orifices (openings). It serves as a physical barrier between the body and the outside world. Skin has covered our skin around 15 m² in surface area. On particular parts of skin, it contains glands, hairs and nails.

Approximately skin covers total 16% of our body weight. Skin act as underlying cushion because it protects our underlying parts of our body like glands, layers etc. It also protects our skin form various ultraviolet rays and harmful chemicals to enter our body. Sometimes it also protects us from various types of microbes and their contamination. Skin also act as regulating agent as it maintains the proper body temperature i.e. 37 °C. it regulates our body temperature by releasing sweat from sweat glands. Skin act as first line defense mechanism because it prevents the entry of various microbes. Skin also act as storage because deepest layer of skin can store various fats, water and metabolic products¹.

1.1 Acne

Skin diseases are caused by toxins collecting in the bloodstream as a result of blood impurities, poor eating habits, and a reduced physical activity. Acne vulgaris is another name for acne. It's a long-term inflammatory condition. It affects the face, neck, upper chest, upper back, and other areas. Acne is the most common ailment in the world, according to studies. It has a psychological and psychosocial impact on the individual. The topical therapies that are now available have little side effects. To minimize these side effects, researchers have created a medicine that incorporates nanotechnology, as well as a combination therapy to reduce the drug's concentration. Acne is named after the Greek word "acne," which means "prime of life." Acne vulgaris is a persistent inflammatory condition that affects the skin. The oil released by the sebaceous gland, also known as the oil/sebaceous glands of the skin, causes inflammation of the skin. Acne is rarely a life-threatening disorder, but it can have a negative impact on a person's self-esteem. Acne is more frequent in those between the ages of 12 and 24, affecting approximately 85 percent of the population. Due to increased amounts of hormones, acne is typical during puberty, when a person transitions from a kid to an adult. As people grow older, acne becomes less common. Acne vulgaris is a very frequent skin condition that affects almost everyone at some point in their lives. Acne is most common in teenagers, but it also affects a significant number of men and women in their twenties and thirties².

1.2 Acne Vulgaris

Acne that affects people from puberty to young adulthood is the most frequent type. Seborrhea, comedones, nodules, papules, pustules, and cysts are all symptoms of acne vulgaris, a general skin disorder. It appears in places of the body where there is a lot of hair development, such as the upper chest, back, legs, and face. Infected sebaceous glands get blocked. Several huge and tiny eruptions develop. A pustule or papule is a tiny inflammatory elevation of the skin that is a typical acne sign. What is the distinction between a pimple and acne? Unlike common acne, rosacea is primarily a disease of adults (ages 30-50), particularly those with fair skin. In contrast to acne, rosacea rarely produces blackheads or whiteheads. Acne is a chronic or long-term condition that affects many teens and adults. Furthermore, these therapeutic herbs are widely available, inexpensive, and widely used by humans. Taking these facts into account, the goal of this work was to comprehensively investigate and analyses the phytoconstituents of various plant extracts in order to develop a new polyherbal emulgel formulation of their anti-acne potential effects³.

2. MATERIALS USED⁴

2.1 Plant Materials

Specimens such as ripe pericarps of fruits are collected. *Citrus sinensis* (Rutaceae) with *Aloe barbadensis* (Liliaceae) leaves *Curcuma longa* rhizomes (Curcuma longaceae) (Zingiberaceae). The specimens for the intended research were gathered and analyzed authenticated. Himedia provided the rest of the chemicals. Mumbai-based Laboratories Pvt. Ltd. and Loba Chemie.

2.2 Microbial Strains

Microbial culture strains are shown in Table 1.

Table 1: Microbial Strain

Microbial strain	NCIM/ ATCC
<i>Staphylococcus aureus</i>	2079/6538P
<i>Staphylococcus epidermidis</i>	2493/1222B

2.3 Chemicals Used

Most commonly used chemicals are as follows (Table 2).

Table 2: Chemicals List

Chemicals	Manufacturing company
Propylene glycol-400	Himedia Laboratories Pvt. Ltd
Ethanol	Himedia Laboratories Pvt. Ltd
Carbopol-940	Astron Chemicals, Ahmedabad, India
Methyl paraben	CDH, New Delhi, India
Propyl paraben	CDH, New Delhi, India
Tween 80	Himedia Laboratories Pvt. Ltd
Triethanolamine	Himedia Laboratories Pvt. Ltd
Span 20	CDH Fine Chemical
Liquid paraffin	CDH, New Delhi, India

3. FORMULATION METHOD

3.1 Formulation of Extract

Extraction was using Soxhlet apparatus

3.2 Method of Preparation of Emulgel

Seven various gelling agents and penetration enhancers were used to create different formulations (figure 1).



Figure 1: Polyherbal Emulgel Formulations F1-F7

4. EVALUATION PARAMETERS

4.1 Pre-formulation Studies

Extraction of Herbal plants

4.2 Phytochemical Screening

The colour of lemongrass oil, Aloe barbadensis and Curcuma longa, tea tree oil was observed yellow, white, brown powder, and pale yellow to clear, whitish respectively shown in figure-2.

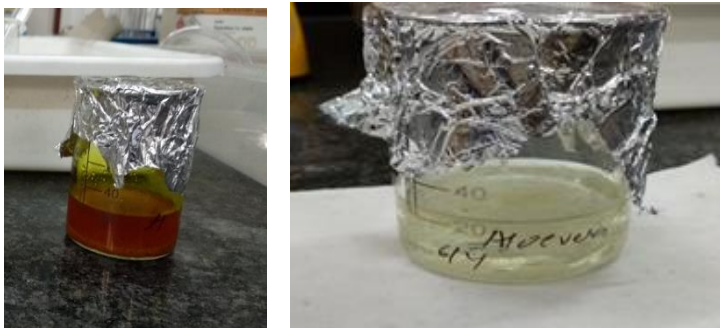


Figure 2: showing extract of Curcuma longa and Aloe barbadensis.

4.3 Calibration Curve

Calibration curves are shown in Figure 3.

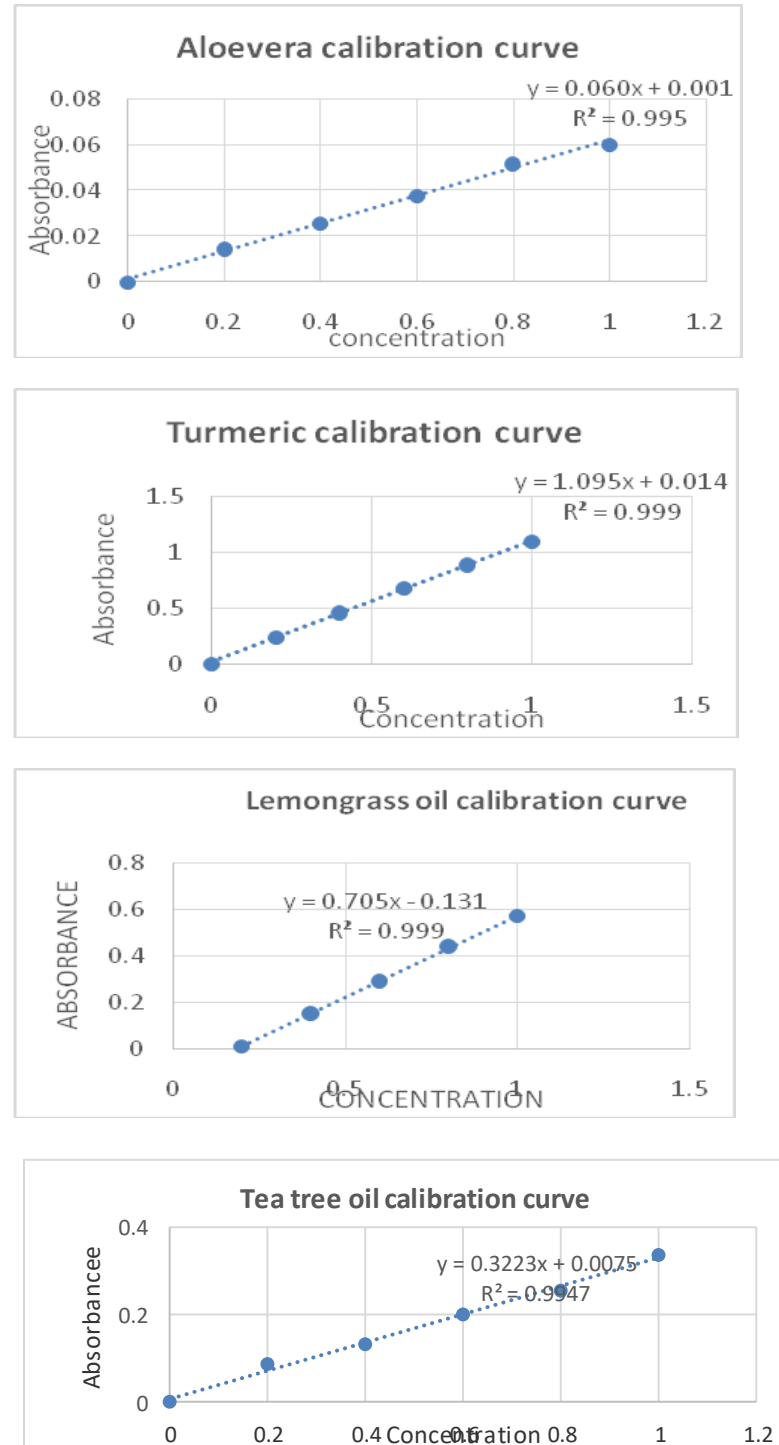


Figure 3: showing calibration curves of Aloe Vera, Turmeric, Lemongrass oil and Tea tree oil

Table 3: Polyherbal Emulgel Formulations F1-F7

Material (%v/v)	F1	F2	F3	F4	F5	F6	F7
Turmeric extract(ml)	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Lemon grass oil (mL)	0.01	0.02	0.03	0.04	0.05	0.06	0.07
Tea tree oil(mL)	0.01	0.02	0.03	0.04	0.05	0.06	0.07
Aloe Vera extract (ml)	0.01	0.02	0.03	0.04	0.05	0.06	0.07
Carbopol 940	1	1	1	1	1	1	1
Liquid paraffin (mL)	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Tween 20 (mL)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Span 20 (mL)	1	1	1	1	1	1	1
Methyl paraben (mg)	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Ethyl paraben (mg)	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ethanol (mL)	2.5	2.5	2.5	2.5	2.5	2.5	2.5
TEA (mL)	1	1	1	1	1	1	1
Water (mL)	100	100	100	100	100	100	100

4.4 Physical Parameter⁵

Polyherbal Emulgel formulations were yellow viscous creamy preparation with a smooth homogeneous texture and glossy appearance.

4.5 pH⁶

The pH value of all the formulations F1-F7 were in range of 5.9-6.9, which are considered acceptable to avoid any risk of irritation on application. F5 formulation has best pH as discussed in table 4.

Table 4: pH of Prepared Formulations

Formulation Code	pH
F1	6.1
F2	6.4
F3	6.3
F4	6.0
F5	6.9
F6	6.5
F7	5.9

4.6 Spreadability⁷

One of the most important characteristics of an emulgel is its capacity to spread. It is a crucial aspect in therapy and serves as an assessment of how easy it is to use. Topical therapy's efficacy is determined by the patient's ability to apply the formulation in an even layer to deliver a dose (table 5). A lower dose would not produce the desired results, while a higher dose could cause unwanted side effects. The spread ability of a drug's formulation is crucial to its administration of the correct dose. When analyzing a formulation's spread ability, essential parameters to consider are the rate and duration of shear caused during smearing, as well as the temperature of the target location. For the formulations F1 to F7, the spread ability of polyherbal Emulgel ranged from 69.74 g.cm/min to 36.74 g.cm/min, respectively. F5 formulations have the best spread ability.

Table 5: Spread Ability of Polyherbal Emulgel Formulation

Formulation	Spread ability
F1	36.74/7.065 gm.cm /min
F2	59.74/9.08 g.cm/min
F3	64.74/3.96 g.cm/min
F4	33.74/8.04 g.cm/min
F5	69.74/7.54 g.cm/min
F6	68.74/7.53 g.cm/min
F7	37.62/6.154 g.cm/min

4.7 Viscosity Studies⁸

In a beaker 100 grams of the gel was taken and the spindle was dipped in it for about 5 minutes and then the reading was taken. F1 to F7 batches were taken and examined. F5 formulation has better viscosity range (table 6).

Table 6: Showing Viscosity Studies

Batch	Viscosity (cps)
F1	7450
F2	8300
F3	9700
F4	9850
F5	16882
F6	4382
F7	6380

4.8 Determination of Drug Content⁹

The drug concentration of emulgel was measured by dissolving a known weight (0.1 gram) of the emulgel formulation in 10 ml ethanol, making suitable dilutions, and then filtering the resultant solution to achieve a clear solution. Lemongrass oil, tea tree oil, and Cur cumin absorbance's were measured using a UV spectrophotometer at 393nm, 284nm, and 421nm, respectively. The simultaneous equation was used to determine the drug concentration of Lemongrass oil, tea tree oil, and Cur cumin in emulgel formulations. The F5 batch shows maximum % of drug content i.e. 80.24%, 85.45%, 77.78% of lemongrass oil, turmeric, tea tree oil respectively.

4.9 In vitro Drug Release of Polyherbal Emulgel

Different emulgel formulations were tested *in vitro* for drug release by using dialysis Membrane are shown in below table and plotted. From the given data we observed that formulation F5 shows highest drug release about 80.24%, 91.391%, 80.02% of Lemongrass oil, Turmeric, Tea tree oil within 4 hr. respectively (figure 4).

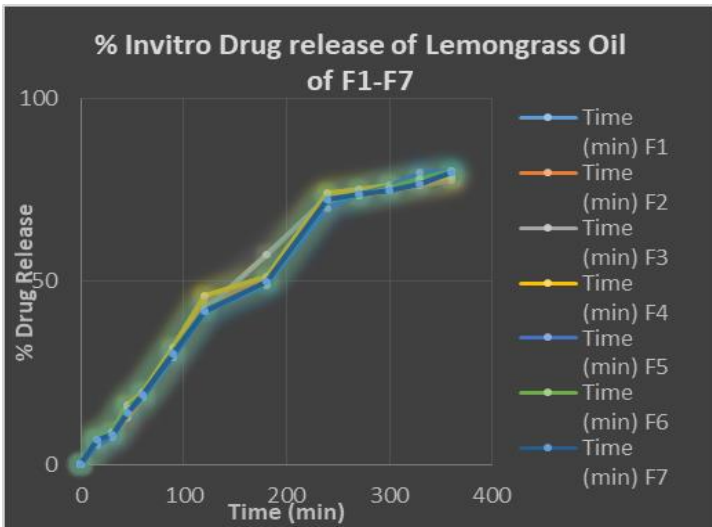
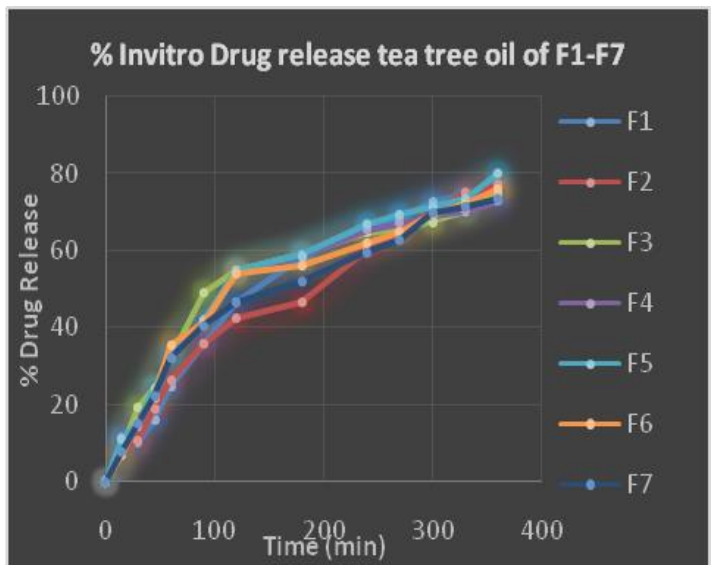
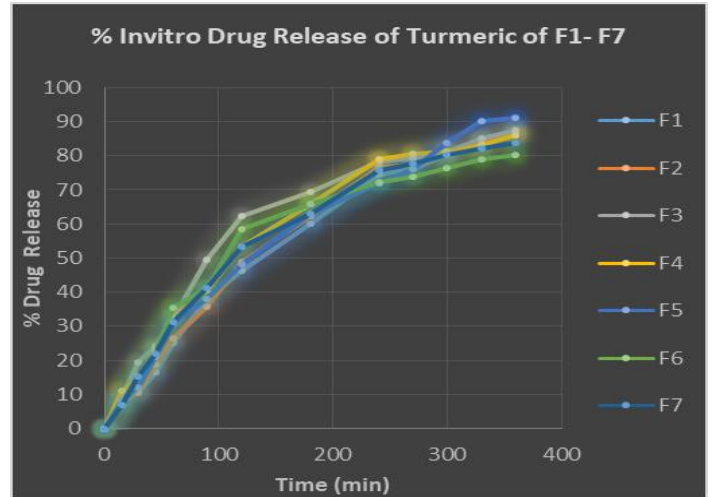


Figure 4: *In-vitro* release studies

4.10 Antimicrobial Testing

Antibacterial activity tests were carried out using the well diffusion method, which involved assessing the zone of inhibition (in mm). The polyherbal gel's results revealed antibacterial effectiveness against acne-causing bacteria in a dose-dependent manner. Figure 5 depicts a study of the formulation's antibacterial efficacy. The formed polyherbal gel F5 had stronger antibacterial activity than the other formulations, with a zone of inhibition of 44 mm for *Staphylococcus aureus*. Furthermore, when compared to individual extracts, the polyherbal gels revealed a synergistic effect, which could be effective in the treatment of local inflammation¹⁰. As a result, this topical formulation was shown to be suitable for the treatment of local anti-acne application and additional testing.



Figure 5: showing anti-microbial activity result

5. CONCLUSION

For the treatment of acne vulgaris, herbal medications are now believed to be safer and have less adverse effects than synthetic drugs. As a result, on the global market. Herbal formulations and other natural medicines are in high demand. The formulation and evaluation of the polyherbal anti-acne emulgel, as well as the stability studies, are excellent. According to the findings, a polyherbal anti-acne emulgel made from the extracts of Aloe barbadensis, and Curcuma longa, Lemon grass oil, Tea tree oil had substantial antibacterial action against Staphylococcus aureus and Staphylococcus epidermis while causing no irritation. When compared to separate extracts with good stability, the polyherbal gel revealed a synergistic effect. As a result of the study's findings, a prepared polyherbal emulgel containing extracts of Curcuma longa, lemon grass oil and tea tree oil at concentrations of 0.5%, 5 percent, 5 percent respectively, can be used to treat acne vulgaris.

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