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"FORMULATION AND EVALUATION OF ANTI-ACNE EMULGEL CONTAINING CORIANDER LEAVES EXTRACT AND LAVENDER OIL"

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ABSTRACT

The present study aims to formulate and evaluate emulgel containing Coriander leaves extract and Lavender oil – A herbal medication for its anti-bacterial potential. The hydro-ethanolic extract of Coriander was prepared by using Rotary evaporator. The extract along with lavender oil was formulated into an emulgel by incorporating emulsion into the gel base. The antibacterial activity of emulgel was evaluated using agar well diffusion method. The hydro-ethanolic extract of Coriander as well as the prepared formulation shows antibacterial activity. All the prepared Emulgel formulation showed acceptable pH, Spreadability, Extrudability and Viscosity. The zone of inhibition increased on increasing the concentration of coriander leaves extract in the formulated emulgel. It can be concluded from the study that F1 has better pH, spreadability and extrudability when compared to F2 formulation.

KEYWORDS: Coriander leaves extract, Lavender oil, Emulgel, Agar Well Diffusion, Zone of inhibition.

INTRODUCTION

The nature has been a source of medicinal plants for thousands of years since the beginning of man. Over the past 20 years, interest in medicinal plants has grown enormously from the use of herbal products as natural cosmetics and self-medication by the general public for their biological effects. According to the WHO, more than 80% of the world's population relies on plant based herbal medicines for their primary health care needs.[1] In addition, in developing countries, synthetic drugs are not only expensive for the treatment of diseases but also often with adulterations and side effects.[2] Herbal medicine also called botanical medicine or phytomedicine, refers to using a plant's seeds, berries, roots, leaves, bark, or flowers for medicinal purposes. It is becoming more mainstream as improvements in analysis and quality control, along with advances in clinical research, show the value of herbal medicine in treating and preventing disease. Medicinal and aromatic plants which are widely used as medicine constitute a major source of natural organic compounds.[3] The major use of herbal medicines is for health promotion and therapy for chronic, as opposed to life-threatening conditions. However, usage of traditional remedies increases when conventional medicine is ineffective in the treatment of disease, such as in advanced cancer and in the face of new infectious diseases. Some natural remedies may be more affordable and accessible than conventional medicines, and many people prefer using them because they align with their personal health ideologies.[4] Some of the herbs that are used as Rosemary, Olive oil, Lavender oil, Fennel, Coriander etc.[5,6]

Coriander, a wonder herb, is the newest rockstar of the beauty regimen world. Be it acne or pigmentation, oily or dry skin, pimples or blackheads, coriander juice works like magic. Coriander is rich in Vitamin C, betacarotene and antioxidants which makes skin soft, smooth and radiant.[7] Lavender oil works to kill bacteria, and this can prevent and heal acne breakouts. It unclogs pores and reduces inflammation when put on the skin. Lavender oil is an essential oil derived from the lavender plant. It can be taken orally, applied to the skin, and breathed in through aromatherapy. Lavender oil can benefit the skin in numerous ways. It has the ability to lessen acne, help even skin tone, and reduce wrinkles. It can even be used to treat other things, such as improving hair health and digestion.[8]

ACNE

Acne is a chronic, inflammatory skin condition that causes spots and pimples, especially on the face, shoulders, back, neck, chest, and upper arms. Whiteheads, blackheads, pimples, cysts, and nodules are all types of acne.[9] Acne is caused by clogged pores and bacteria, and it's often challenging to manage. Over-the-counter and prescription treatments may help, though some can cause serious side effects.[10] It commonly occurs during puberty, when the sebaceous glands activate, but it can occur at any age. It is not dangerous, but it can leave skin scars. At least 85 percent of people in the U.S. experience acne between the ages of 12 and

24 years.[7] Herbal remedies were used to clear up acne and other skin conditions well before modern treatments existed. Herbal remedies tend to have fewer side effects than modern treatments. Some herbs have antibacterial, anti-inflammatory, and antiseptic properties. These properties may help reduce acne-causing bacteria and inflammation, and heal blemishes.[11]

EMULGEL

When gels and emulsions are used in combined forms are referred as Emulgels. Emulgels are emulsions, either of the oil-in-water or water-in-oil type, which is gelled by mixing with a gelling agent.[12] Emulgels for dermatological use have several favourable properties such as being thixotropic, greaseless, easily spreadable, easily removable, emollient, non -staining, water-soluble, biofriendly, transparent, pleasing appearance, cosmetically acceptable and also have good skin penetration.[13] Emulgel is recent technology in novel drug delivery system used for controlled release of emulsion and gel for the purpose of topical use. The stability of emulsion is increased, when it is incorporated in the gel bases.[14] Emulgel are being used for the treatment of various anti-inflammatory activity and other skin related bacterial, viral and fungal infections.[15,16]

MATERIALS AND METHODS

Coriandrum sativum leaves and Lavendar oil were collected from local market. Glycerol Monostearate was obtained by Loba Chemie. Cetostearyl Alcohol, Liquid Paraffin Isopropyl myristate, Carbopol 940, Triethanolamine and Sodium Benzoate was obtained from Hi Media Laboratories. Glycerine was obtained from Medilise.

Preparation of coriander leaves extract[17]

The coriander leaves were dried in the shade for upto 7 days and were powdered. This coarse powder was macerated with distilled water and ethanol (hydroethanolic extract) in 60:40 ratio respectively for 3 days at room temperature (25±2℃). Frequent agitation and circulation of solvent was maintained in order to decrease the boundary layer phenomenon and enhance the efficiency of extraction process. After 3 days, the extracted solution was filtered and marc was pressed. Then the enriched extract was concentrated in a rotary vacuum flash evaporator to remove the ethanol and then it was kept on water bath to remove the water content.

Fig. 1-Dried powdered coriander leaves.

Fig. 2-Coriander extract.

Preliminary phytochemical screening of coriander leaves extract and lavender oil.[18, 19]

Table 1: Preliminary Phytochemical screening of Coriander leaves extract.

Phytoconstituents	Test	Observation	Inference
Alkaloids	**Wagners test** **Hagers test**	Formation of reddish brown precipitate. Formation of yellow precipitate.	Alkaloids are present.
Carbohydrates	**a) Molisch Test:** **b) Barfoed's test:**	Appearance of purple ring at the junction. Red precipitate is formed.	Carbohydrates are present.
Reducing sugars	Sample solution mixed with small amount of Fehling's solutions.	Red precipitate	Reducing sugars are present
Flavonoids	a) Extract is mixed with small amount of Magnesium hydroxide solution + dilute acid **b) Lead acetate test:** Extract is mixed	Appearance of colorless solution.	Flavonoids are present.

	with 10% lead acetate solution.	Appearance of yellow color	
Glycosides	0.5 ml of crude extract was treated with chloroform and the chloroform layer was separated. To this equal amount of ammonia was added	Ammonia layer acquires pink colour.	Glycosides are absent
Cardiac Glycosides	0.5 ml of crude extract was mixed with 2ml of glacial acetic acid containing 2-3 drops of 2% solution of $FeCl_3$. Then 2ml of concentrated H_2SO_4 was poured into the mixture.	A brown ring at the interface	Cardiac Glycosides are present.
Tannins	1 ml of distilled water and 2-3 drops of ferric chloride solution was added to 0.5 ml of crude extract.	A black coloration was formed.	Tannins are present.
Phenols & Tannins	Extract were treated with diluted iodine solution separately.	Appearance of transient red colour	Presence of Tannins and Phenols.

Table 2: Preliminary Phytochemical screening of Lavender Oil.

Phytoconstituents	Test	Observation	Inference
Tannins	1 ml of distilled water + 2-3 drops of ferric chloride solution was added to 0.5 ml of crude extract.	A black coloration was formed.	Tannins are present
Saponins	1ml of sample was added with 2ml of distilled water, shaken vigorously	Foam appearance.	Saponins are present
Terpenoids	1ml of extract + 2 ml of chloroform ($CHC1_3$) + 3 ml concentrated sulphuric acid (H_2SO_4) was carefully added to form a layer.	Reddish brown coloration at the interface.	Terpenoids are present
Carbohydrates	Extract is mixed with small amount of Molisch's reagent in a test tube and mixed well+ concentrated sulphuric acid was slowly added down the sides of the sloping test tube.	Appearance of purple ring at the junction.	Carbohydrates are present.
Anthraquinones	Sample + chloroform and then the chloroform layer was separated. To this equal quantity of dilute ammonia solution was added.	Ammonia layer acquires pink color .	Anthraquinones are absent.
Cardiac Glycosides	0.5 ml of crude extract + 2ml of glacial acetic acid containing 2-3 drops of 2% solution of $FeCl_3$. Then 2ml of concentrated H_2SO_4 was poured into the mixture.	A brown ring at the interface.	Cardiac Glycosides are present
Alkaloids	**a) Mayers test:** **b) Wagners test :**	Formation of cream color precipitate. Formation of reddish brown precipitate	Alkaloids are present. Alkaloids are present.
Proteins	Crude extract + 2ml of Millon's reagent and heated.	Precipitate appeared which turned red on gentle heating.	Proteins are present

Method of preparation of anti-acne emulgel[20]

Emulsion: The oil phase was prepared by dissolving Glycerol monosterate, Cetosteryl alcohol, Liquid paraffin and Propyl myristate. The aqueous phase was prepared by mixing Glycerine, Sodium benzoate, coriander leaves extract and quantity sufficient water. Next both oil and aqueous phases were heated separately to 70ºC and then oily phase along with sufficient quantity of lavender oil was mixed with aqueous phase with continuous stirring until the desired emulsion is obtained.

Gel: The Carbopol gel was prepared by dispersing carbopol 934 in purified water with constant stirring at a moderate speed manually and then use homogenizer for better dispersion. The gel was obtained by neutralizing the dispersion with triethannolamine and adjusting pH to 6.5.

Emulgel: The obtained emulsion was mixed slowly with the gel in 1:1 ratio to get an emulgel.

Table 3: Formulation Chart.

Ingredients	F1	F2
Water phase:		
Coriander leaves extract	4gm	6gm
Glycerine	10ml	10ml
Sodium benzoate	0.2gm	0.2gm
Purified water	100ml(q.s.)	100ml(q.s.)
Oil phase:		
Glycerol monosterate	2g	2g
Cetosteryl alcohol	4g	4g
Liquid paraffin	14ml	14ml
Propyl myristate	2g	2g
Lavender oil	0.5g	0.5g
Gel phase:		
Carbopol 940	2g	100ml
Triethanolamine	q.s.	

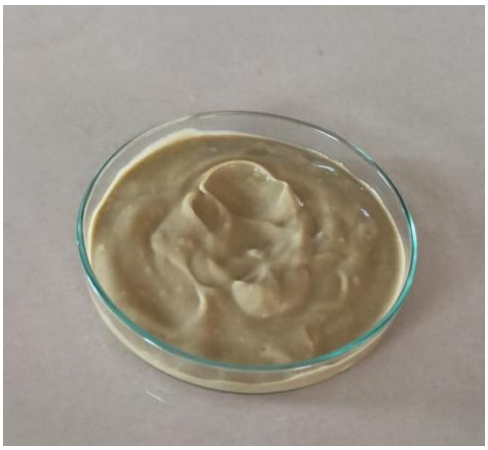

Fig. 3 - Emulgel formulation.

EVALUATION OF EMULGEL[21,22,23,24]

1. **Organoleptic Characterization**: The formulated emulgel was evaluated for physicochemical test to observe which formulation had the best result.
2. **Washability Test**: Washability of the Emulgel was performed so as to evaluate the capability of the Emulgel being washed without damaging the site of application and also to know how long it can reside on the area where it is being applied. Formulations were applied on the skin and the care and extent of washing with water was checked manually.
3. **pH:** 1gm of gel was dissolved in 100 ml of distilled water and it was placed for 2 hr and then dip the glass electrode into an emulgel. The measurement of pH of each formulation was done in triplicate and average values were calculated.
4. **Viscosity:** Viscosity of the emulgels was determined using Brookfield viscometer, Spindle (no: 42) type, model LVDV-E at 0.6 rpm. Small amount of the emulgel was taken in the cup and the spindle was dipped in it for about 5 minutes and then the readings were taken.
5. **Spreadability test:** The Spreadability was expressed in terms of time in seconds taken by two slides to slip off from the emulgel which was placed in between the slides, under certain load. Lesser the time taken for separation of the two slides, better the spreadability. Two sets of glass slides of standard dimensions were taken. The herbal emulgel formulation was placed over one of the slides. The other slide was placed on the top of the emulgel, in such a way that the emulgel was sandwiched between the two slides in an area occupied by a distance of 7.5 cm along the slide. Spreadability was calculated using formula:

S=M.L/T

Where,

M= weight tied to upper slide (10g)

L = length of glass slide (6.8cm)

T = Time taken to separate the slides

6. **Extrudability study:** It is an usual empirical test to measure the force required to extrude the material from tube. In the present study, the method adopted for evaluating emulgel formulation for extrudability is based upon the quantity in percentage of emulgel and emulgel extruded from lacquered aluminum collapsible tube on application of weight in grams required to extrude at least 0.5cm ribbon of emulgel in 10 seconds. More quantity extruded better is the extrudability. The measurement of extrudability of each formulation is in triplicate and the average values are presented.

The extrudability is then calculated by using the following formula:

Extrudability = Applied weight to extrude emulgel from tube (in gm) / Area (in cm^2).

7. **Antibacterial property (Zone of inhibition):** Agar well diffusion method is widely used to evaluate antibacterial activity of plant extracts. The petri-plate filled with the agar media (3/4 of the petri-plate) containing microbial inoculum. A hole with the diameter of 6-8 mm is punched aseptically with a sterile cork borer and a volume (20-100 µL) of the formulation was introduced into the well. Agar plates were incubated at 37^0C for 24 hours. The antibacterial agent diffuses in the agar medium and inhibits the growth of microbial strain.

RESULTS AND DISCUSSIONS

Phytochemical screening

The Emulgel was prepared by using Coriander leaves extract and Lavender oil. Coriander leaves extract and Lavender oil are the active ingredients for which the phytochemical tests were conducted.

Table 4: Results of Preliminary phytochemical screening of Coriander Extract.

Phytochemical	*Coriandrum Sativum*
Alkaloids	+
Carbohydrates	+
Reducing Sugars	+
Flavonoids	+
Glycosides	-
Cardiac Glycosides	+
Phenols and Tannins	+

Table 5: Results of Preliminary phytochemical screening of Lavender Oil.

Phytochemical	*Lavandula Angustifolia*
Tannins	-
Saponins	-
Terpenoids	+++
Carbohydrates	++
Antraquinone	-
Cardiac glycosides	++
Alkaloids	++
Protiens	+

Organoleptic characteristics and Evaluation of the formulation

Organoleptic evaluation: The prepared anti-acne emulgel showed good characteristics in terms of appearance, color, washability, homogeneity, odour and consistency.

Table 6: Results of Physiochemical evaluation of emulgel.

Evaluation test	Results
Appearance	Good
Colour	Amber gold
Spreadability	Good
Homogeneity	No lumps
Consistency	Thick
Washability	Good

Evaluation Parameters

Table 7: Various Evaluation Parameters of the Emulgel.

Formulation	F1	F2
pH*	6.5±0.1	6.9±0.2
Viscosity (cps)	157000	127000
Spreadability* (cm)	6.5± 0.251	6.4± 0.2083
Extrudability *	96.98%±0.0435	98.19%±0.0308

**Data expressed as a mean ±SD, n=3*

pH: The pH of the emulgel was determined by using digital pH meter. From the result it was found that both the formulation had desired pH which is compatible to the skin.

Viscosity: It was determined by using Brookfield viscometer. The viscosity of F1 was found to be higher than F2.

Spreadability: It was measured in terms of diameter of emulgel spread area produced upon application of specified weight. The values of the spreadabilty indicate that F1 is easily spreadable.

Extrudability: Extrusion of emulgel from the tube is important during application and for the patient compliance. The result shows that F1 extrudes less emulgel when compared to F2.

Antibacterial activity

Table 8: Zone of inhibition of emulgel.

Concentration (mg/ml)	Zone of Inhibition (mm) (Gram negative *Escherichia Coli)*
Negative control	Nil
F1	20mm
F2	21mm

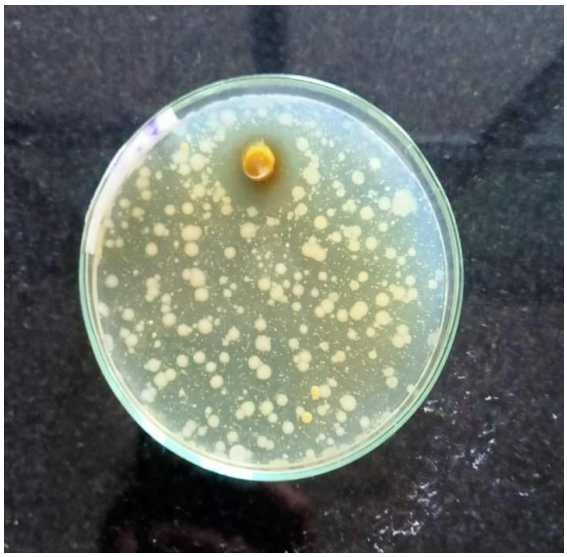

Fig. 4 - F1 zone of inhibition.

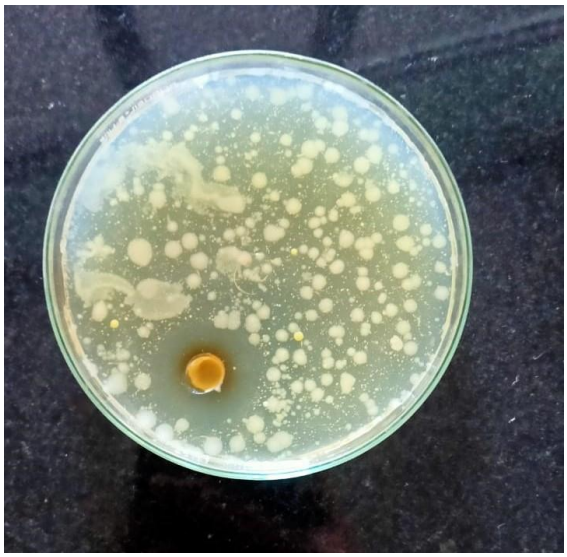

Fig .5 - F2 zone of inhibition.

Antibacterial activity: Antibacterial activity was checked by agar well diffusion method and the zone of inhibition was measured using zone reader. The results are given in Table 8. It was observed that as concentration of extract is more in F2 and the zone of inhibition was slightly larger in F2 when compared with F1.

CONCLUSION

Most of the countries are using herbal medicines from past thousands of years for treatment of various disease. Studies have shown that coriander leaves and lavender oil have many components, which have properties including antibacterial activity, anti-inflammatory and soothing effect. So in this work an attempt was made to use this coriander leaves extract and lavender oil into topical emulgel. The preliminary phytochemical screening studies showed that the extract of Coriander leaves possess active constituents like alkaloids, flavonoids, phenols and tannins. All the formulations were almost neutral, falling in the pH range suitable for skin. The formulated emulgels were subjected to physicochemical studies and were found to be optimum in terms of viscosity, spreadability and extrudability. Also the F2 formulation inhibits the growth of bacteria in a slightly better way. It was finally concluded that the F2 formulation was best among the others. Future research work can be conducted by evaluating other parameters and by conducting some other tests using animal models.

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