



FORMULATION AND EVALUATION OF ANTI-BACTERIAL & SCABIES CREAM OF COCONUT OIL (LAURIC ACID)

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ABSTRACT

Objective: The main aim of our research was to develop an Anti-Bacterial cream formulation consisting of Lauric acid for the treatment of Bacterial infection and Scabis. Topical route is the most suitable route for skin infections.

Methods: The development of topical drug delivery systems designed to have systemic effects appears to be beneficial for a number of drugs on account of several advantages over conventional dosage forms(or) routes of drug administration. An Anti-Bacterial cream formulation consisting of Lauric Acid was prepared.

Results: The formulation was subjected to *in vitro* diffusion studies. Microbiological studies were performed to find out the safety of materials used in the formulation.

Conclusion: The developed cream consisting of Lauric acid was found to be safe and effective for the treatment of bacterial infection & scabies.

Keywords: Bacterial infection, Coconut oil, Lauric Acid, AntiScabies cream.

INTRODUCTION

Several anti bacterial agents are available on the market in different topical preparations (e. g., creams, ointments, and powders for the purpose of local dermatological therapy). One of these antibacterial agents is LAURIC ACID (Coconut oil), which has both anti-bacterial and antibacterial properties. It is applied locally in mild uncomplicated dermatophyte and other cutaneous infections .

Bacterial infections are diseases that can affect your skin, lungs, brain, blood and other parts of your body. You get them from single-celled organisms multiplying or releasing toxins in your body. Common bacterial diseases include UTIs, food poisoning, STIs and some skin, sinus and ear infections.

Bacterial infections (also called mycoses) represent the invasion of tissues by one or more species of fungi which may cause superficial, localized, deeper tissue infections to serious lung, blood (septicemia) or systemic diseases. Some fungi are pathogenic, causing disease whether the immune system is healthy or not.

Scabies is a skin condition caused by the *Sarcoptes scabiei* var *hominis* mite. These little bugs make tunnels (burrow) under your skin and cause small red bumps and severe itching. Scabies spreads easily from person to person, especially among people who live close together. If one family member has scabies, a provider should check and treat other family members and close contacts at the same time.

Topical treatment of Bacterial infections has several superiorities including, targeting the site of infection, reduction of the risk of systemic side effects, enhancement of the efficacy of treatment and, high patient compliance. Different type of topical effective antibacterial compounds has been used in the treatment of a variety of dermatological skin infections.

Currently, these antibacterial drugs are commercially available in conventional dosage forms such as creams, gels, lotions and sprays.

The most common therapeutic options are systemic and topical antibacterial agents; however, oral anti bacterial are associated with adverse effects that can cause patients to discontinue treatment, which may be complicated by the presence of comorbid conditions.

Antibacterial drugs should reach effective therapeutic levels in viable epidermis after dermal administration. The greatest challenge for dermal delivery is stratum corneum, in order to improve its permeability, new formulation approaches have been investigated.

Ivermectin is the medication given for the treatment of Scabies.

Coconut Oil :-

Coconut oil is an edible oil derived from the kernels, meat, and milk of the coconut palm fruit. Coconut oil is a white solid fat below around 26 °C (77 °F), and a clear thin liquid oil in warmer climates. Unrefined varieties have a distinct coconut aroma. It is used as a food oil, and in industrial applications for cosmetics and detergent production. Due to its high levels of saturated fat, numerous health authorities recommend limiting its consumption as a food.

Coconut oil is 100% fat, 80-90% of which is saturated fat. This gives it a firm texture at cold or room temperatures. Fat is made up of smaller molecules called fatty acids, and there are several types of saturated fatty acids in coconut oil. The predominant type is lauric acid (47%), with myristic and palmitic acids present in smaller amounts, It also present in trace amounts are monounsaturated and polyunsaturated fats.

Coconut oil contains no cholesterol, no fiber, and only traces of vitamins, minerals, and plant sterols. Plant sterols have a chemical structure that mimics blood cholesterol, and may help to block the absorption of cholesterol in the body.

Coconut Oil and Health:-

Many of the health claims for coconut oil refer to research that used a special formulation of coconut oil made of 100% medium-chain triglycerides (MCTs), MCTs have a shorter chemical structure than other fats, and so are quickly absorbed and used by the body. After digestion, MCTs travel to the liver where they are immediately used for energy. The theory is that this quickly absorbed form promotes satiety and prevents fat storage. Coconut oil contains mostly lauric acid, which is not an MCT. Lauric acid is absorbed more slowly and metabolized like other long-chain fatty acids. So the health benefits reported from a specially constructed MCT coconut oil that contains medium-chain triglycerides other than lauric acid cannot be applied directly to commercial coconut oils.

Skin Benefits:-

It hydrates skin. "Coconut oil acts as an emollient, which aides in the moisturization of skin.

Locks in moisture. "A 2014 clinical study showed that pediatric patients with mild to moderate atopic dermatitis who used virgin coconut oil for eight weeks showed improvement in decreased transepidermal water loss and increased skin hydration.

It soothes inflammation. "It has anti-inflammatory properties that help to reduce skin irritation.

It has antimicrobial properties. "The rich fatty acid content found in coconut oil can help stop the growth of certain microorganisms on the skin.

It protects from certain infections. Due to saturated fats.

Anti-Bacterial Properties Of Coconut Oil:-

The modern scientists and health experts have popularized the use of coconut oil due to its several health benefits. Lauric acid is a medium chain fatty acid that promotes the antiviral properties of coconut oil.

Medium chain fatty acids or medium chain triglycerides such as capric acid, caprylic acid, and lauric acid combat the attack of several viruses that can lead to severe health disorders. Coconut oil may not treat the disease from its grassroots, but it will definitely reduce the symptoms of the disease and combat the viral infection spread throughout the body.

Viruses coated with fat lipids are destroyed due to the consumption of coconut oil. Coconut oil is a great treatment option for sexually transmitted viral diseases such as herpes, HIV, hepatitis C, and mononucleosis. Daily consumption of coconut oil reduces the development of symptoms of such viral infections.

Capric acid and lauric acid are absorbed by the skin cells quickly and converted into monoglycerides such as monocaprin and monolaurin. They attach to the protective layer of the viral infection, attack the internal components, and kill the viruses.

MATERIALS AND METHODS

Materials

Bees wax, cetyl alcohol, Triethanolamine, propylparaben, methyl paraben, liquid paraffin. Stearic acid, coconut oil & aloe vera gel were taken from DR.D.Y Patil College Of Pharmacy, Akurdi, Pune.

A] Stearic Acid:-

Stearic Acid is a saturated long-chain fatty acid with an 18- carbon backbone. Stearic acid is found in various animal and plant fats, and is a major component of cocoa butter and shea butter.

Improving the efficacy and texture of cleansers, lotions and skin care/hair products. Stabilizing the texture of shaving creams and lubricants

Creating detergents, house cleaners and textile softeners



B] Cetyl Alcohol:-

This medication is used as a moisturizer to treat or prevent dry, rough, scaly, itchy skin and minor skin irritations (such as diaper rash, skinburns from radiation therapy). Emollients are substances that soften and moisturize the skin and decrease itching and flaking.



C] Triethanolamine:-

Triethanolamine (TEA) is a non-active ingredient that does not have any effect on the skin but is only used to balance the pH of formulations and stabilize them. This ingredient improves the feel of the product and the way that it interacts with the skin.



D] Methylparaben:-

Methylparaben is one of the most common parabens. You can find it as part of a paraben mix in most cosmetic products, where it prevents germ growth. It can also be found naturally in some fruits and may be used as a food preservative or an antibacterial preservative.

E] Propylparaben:-

Any kind of paraben helps to enhance the shelf life and safety of a cosmetic product by preventing the growth of microorganisms.

F] Aloe Vera Gel:-

Aloe vera is a plant of the cactus family, and is very popular for its cosmetic as well as medicinal properties. The transparent gel-like liquid, found in the inner part of the leaf is what gives this plant the amazing benefits.

G] Coconut oil:-

is an edible oil derived from the wick, meat, and milk of the coconut palm fruit. Coconut oil is a white solid fat below around 25 °C. Coconut oil contains only trace amounts of free fatty acids (about 0.03% by mass). Most of the fatty acids are present in the form of esters. In the following content, the expressions "fatty acids" and "acid" below refer to ester rather than carboxylics.

Fatty Acid	Concentration[%]
Caproic	2.215
Caprylic	12.984
Lauric	47.28
Myristic	15.80
Palmitic	6.688

Lauric Acid:-

Lauric acid is one of those active parts. It's a medium-length long-chain fatty acid, or lipid, that makes up about half of the fatty acids within coconut oil.

This naturally derived fatty acid is a major component in a lot of skincare products, especially those that are formulated using natural ingredients. Regularly using products enriched with lauric acid helps reduce conditions such as psoriasis. Additionally, lauric acid is well-known for its antimicrobial properties and is a natural way to fight against infection-causing bacteria.

Lauric acid is a powerful substance that's sometimes extracted from the coconut for use in developing monolaurin. Monolaurin is an antimicrobial agent that's able to fight pathogens such as **bacteria**,

Virues and Yeasts.

Because it's irritating and not found alone in nature, you can't ingest lauric acid on its own. You're most likely to get it in the form of coconut oil or from fresh coconuts.

Table 1: Formulae for cream base

	S. No.	Ingredients	Quantity in gm (20gm)			
			F1	F2	F3	F4
Oil phase(A)	1	Stearic acid	3	3.5	4	4.5
	2	Cetyl alcohol	0.1	0.2	0.1	0.2
	3	Potassium Hydroxide	0.1	0.1	0.2	0.3
	4	Sodium Hydroxide	0.03	0.02	0.01	-
	5	Coconut oil	1	2	3	4
	6	Liquid Paraffin	0.5	0.5	1	1.5
Aqueous phase (B)	7	Glycerine	1	1.5	2	2.5
	8	Triethanolamine	1.5	1.5	1.5	1.5
	9	Methyl Paraben	0.04	0.03	0.04	0.02
	10	Propyl Paraben	0.04	0.03	0.02	0.02
	11	Aloe vera gel	2	4	6	8
	12	Perfume	Qs	qs	Qs	qs
	13	Water	to 10ml	qs to 10 ml	qs to 10 ml	qs to 10 ml

Preparation of o/w cream formulation

These o/w emulsion-based preparations contain the aqueous phase and oil phase.

OIL PHASE:-

- Weigh all the ingredients of OILPHASE (A) properly.



- All the ingredients of oil phase (A) were mixed together by melting in a china dish at 70 °C on a water bath with constant stirring.



AQUEOUS PHASE:-

- Weigh all the ingredients of OIL PHASE (A) properly.
- The components of the aqueous phase (B) were mixed together separately in a beaker and heated about the same temperature as of the oil phase on a water bath.



- The aqueous phase was added to the oil phase drop by drop with constant stirring using an emulsifier. Then add distilled water and add to the above mixture and stir continuously until formation of cream.
- The preservatives propylparaben and methylparaben were added after cooling to 40 °C.
- Fill the cream in the tube container



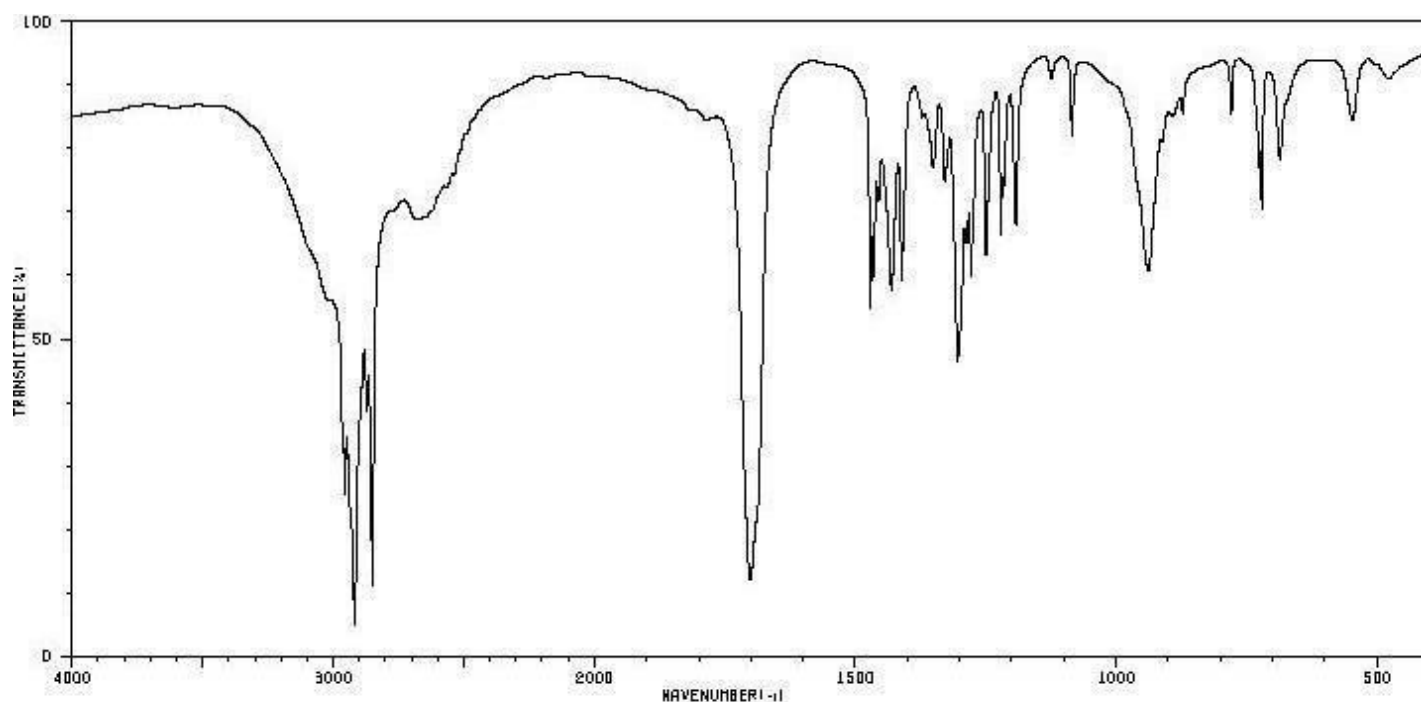
RESULTS:-

Evaluation parameters

Take about 1 gram of cream in a clean petri dish and observe it.

Infrared spectral analysis

IR spectral analysis is one of the most powerful analytical techniques which offer possible chemical identification. In the present work, IR spectrum of Lauric acid pure drug and Lauric acid along with other excipients in the formulation was studied for their interactions.



ITEM	VALUE
SAMPLE NAME	LAURIC ACID
SAMPLE ID	SOLID
DATE OF MANUFACTURING	04/04/2023

Fig. 1: FTIR-graph of pure Lauric Acid API

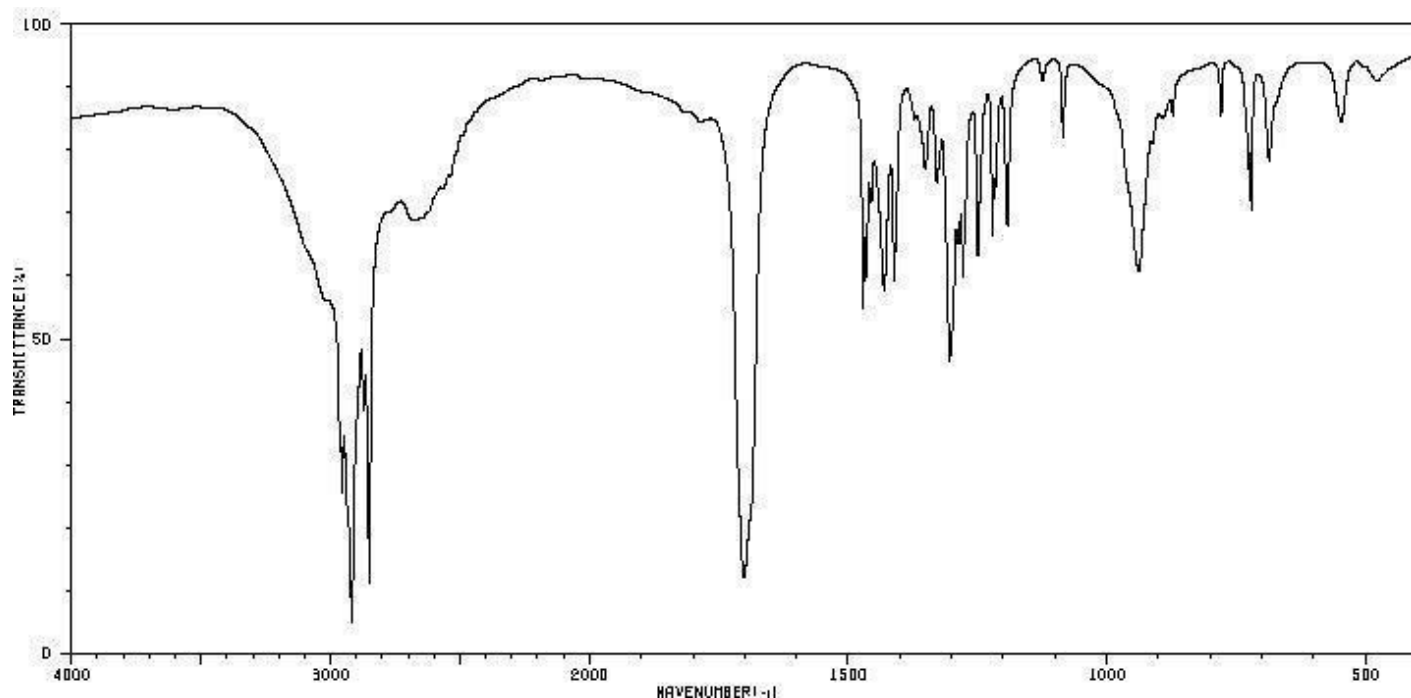
IR Spectrum of pure drug Lauric acid exhibited its characteristic absorption bonds in the following IR region in.

Table 2:IR Spectrum of pure drug Lauric acid exhibited itscharacteristic absorption bonds

FREQUENCY	BONDS	INFERENCE
3241.77 CM -1 (3190-3390)	BROADPEAK	Broad peak to hydrogen bonded O-H stretching

Table 3: IR Interpretation of Lauric Acid

Wavelength	Group
3398.85 cm-1	Aromatic C-H Stretch
3387.69 and 3388.67 cm-1	C-H Stretching of CH ₂ Group
2953.47, 2937.11, 2929.44, 2850.36 cm-1	C=C Ring Stretching
1660.81 and 1462.00 cm-1	C-H Bonding of CH ₂ Group
1425.14 cm ⁻¹	O-H Bonding
1384.82 cm ⁻¹	C-O-C
870.64 cm ⁻¹	Para Substitutional Benzene
776.94 cm ⁻¹	C-Cl
698.24 cm ⁻¹	C--O
583.84 cm ⁻¹	O--Na



ITEM	VALUE
SAMPLE NAME	LAURIC ACID
SAMPLE ID	SEMI-SOLID
DATE OF MANUFACTURING	04/04/2023

Fig. 2:-FTIR-graph of pure Lauric acid with other excipients

Table 4: IR Spectrum of Lauric acid with other excipients and Aloe vera gel

Frequency	Bonds	Inference
3341 cm ⁻¹ (3192-3392)	Broad peak	Some OH peaks of excipients must have merged with OH peaks of the drug. Hence very broad peak of hydrogen-bonded O-H stretching.

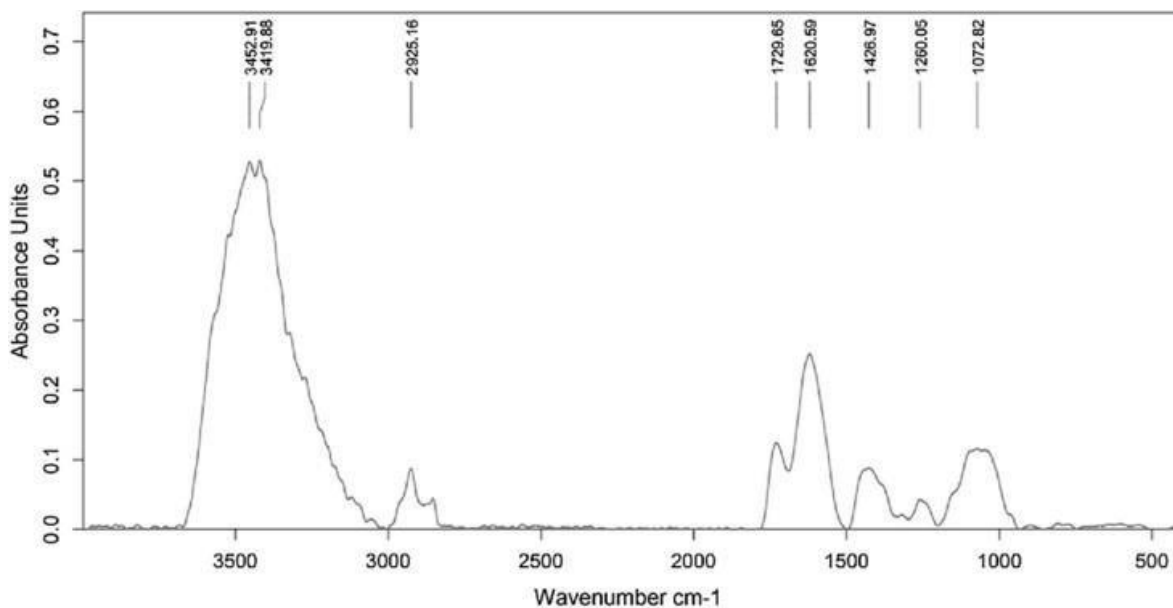


Fig. 3: FTIR-graph of pure lauric acid with other excipients and Aloe vera gel

IR Spectrum of Lauric acid other excipients and Aloe vera gel exhibited its characteristic absorption bonds in the following IR region in with

Table 5: IR Interpretation of Lauric acid with other excipients and aloe vera gel

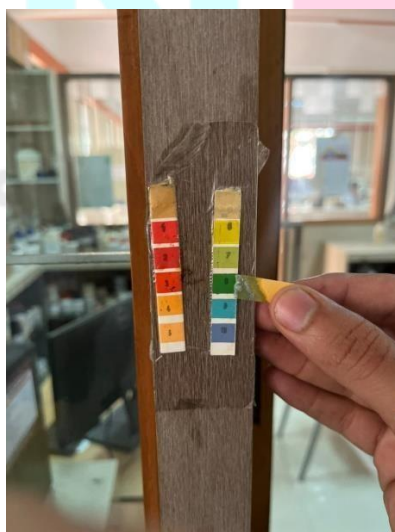
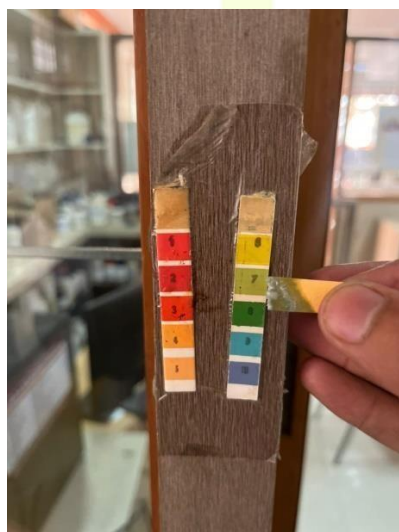
Wavelength	Group
3452.46 and 3419.18 cm ⁻¹	C-H Stretching of CH ₂ groups
2925.52 cm ⁻¹	C=C Ring Stretching
1729.36 and 1620.47 cm ⁻¹	C-H bonding of CH ₂ Group
1426 cm ⁻¹	O-H Bonding
1260.71 cm ⁻¹	C-O-C
1072 and 1000 cm ⁻¹	C-Cl
850.23 cm ⁻¹	C--O
660.28 cm ⁻¹	O--Na

Physical examination

The prepared topical antibacterial creams were inspected visually for their color, homogeneity, consistency, spreadability and phase separation. The results are shown in table 6 and 7.

Determination of pH

Weigh about 5 gm of the cream and dispersed in 45 ml of water in a 100 ml beaker. The pH was determined at 30 °C using the pH paper. The results are shown in table 6 and 7.



Spreadability Test:-

- The spreadability test is the most important of a cream.
- Texture of cream must be smooth
- Cream should be easily spreadable.
- Cream should not break.
- Take a small amount of cream on a slide.
- Spread it on slide with another slide.
- Then keep the another slide over it and keep some weight on it.
- Check the sliding of slide.

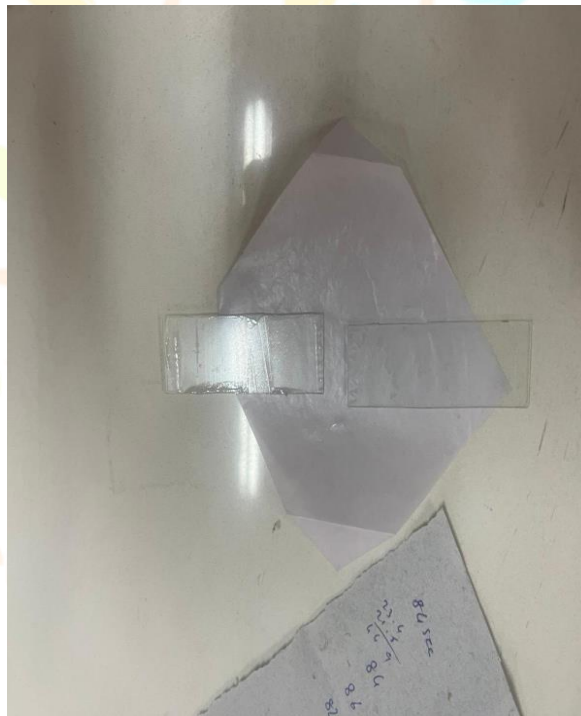




Table 6: Physico-chemical evaluation of formulation

S. No.	Formulationcode	Appearance	pH	Consistency
1	F1	White	7	Poor (liquid)
2	F2	White	7.08	Creamy
3	F3	White	7.9	Hard
4	F4	White	7.1	Creamy

Table 7: Physico-chemical evaluation of F4 formulation and marketed product

Trial code	Appearance	pH	Drug content	Tube extrudability	Spreadability
Marketed product	White	7.0	99.42	99.7%	19.2
F4	White	7.1	97.40	97.6%	18.9

Tube extrucibility:-

- The method used for evaluating cream formulation for extrudability was based upon the quantity in percentage cream extruded from tube on the application of finger pressure.
- More the quantity extruded better the extrudability.
- The formulations were filled in a clean, lacquered aluminum collapsible 5 grams tube . The pressure was applied on the tube by holding it in between the thumb and index finger for 1 sec.
- Tube extrudability was then determined by measuring the amount of cream extruded through the tip when the pressure applied.

DISCUSSION:-

From the above data, the study shows that the formulation is showing good results for the treatment of anti bacterial activity.

As a part my research work, Infra-red spectra of pure drug Lauric acid and its formulation are taken interpretation of above IR spectra shows that the characteristic absorption bonds of different function groups and bonds present in the drug are present in both formulations, Even if some variation in the position of absorption bonds is observed, it is negligible and it is within the range, this clearly suggests that there is no interaction of the drug with excipients used in the preparation of formulations. Hence it may be concluded that the drug has no interaction with the excipients used and thus, there is drug-excipients compatibility.

CONCLUSION:-

The formulation of the ant-bacterial & anti scabies agent lauric acid exhibited an enhanced rate of diffusion and anti-activity. The results of different chemical and physical tests of cream showed that it could use topically in order to protect against skin infections caused by bacterias and scabies.

FUNDING:-

Nil

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