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Research Article

Glycyrrhizic acid based cosmeceutical face sheet mask

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Abstract

The application of cosmetics for the skin started in the Egyptian ages. The protection of the skin and face is essential for everyone in the modern era because of various pollutants released into the environment by the technology. Even the skin can be affected by the UV light directly due to the destruction of Ozone layer. The various microbial infections caused by the *Staphylococcus*, *Micrococcus*, and *Corynebacterium species* can affect the skin by eczema like conditions. Formulate and evaluation of Glycyrrhizic acid from the liquorice root along with honey and other ingredients on the *E.Coli, Staphylococcus aureus, Bacillus subtilis microorganisms.* The face mask was prepared by mixing the Glycyrrhizic acid and honey in the base contains the Sodium benzoate, Propylene glycol, HPMC, Tween 80 and perfume. The application of the formulation as the face mask by using the paper sheet on the skin can be able to moisturise, protect from UV and also provide anti-microbial activity. The formulation was evaluated for the organoleptic parameters, pH and antimicrobial activity. The results show that the formulation exerted significant antimicrobial activity and non-irritant effects on the skin with the pH 6.8. The zone of inhibition was observed for the respective microorganism groups. The work concluded that isolated herbal compounds can improve efficacy and safety when compared with synthetic molecules which can easily be compatible with the skin.

1. Introduction

Herbal plants have been used in cosmetics since the time of the ancient travellers. The word "cosmetics" comes from the Latin word “cosmetae," which was used to refer to the servants who performed the bathing for the men and ladies of the Roman monarchs [1]. Cosmetics are defined as "any article meant to be rubbed, poured, sprinkled, sprayed or applied to any area of the human body for washing, beautifying, encouraging attractiveness or altering the appearance, and includes any material intended for use as a component of cosmetic [2]. About 67% of consumers globally used various creams and lotions for the sun protection and protecting the skin from pollutants globally. Mechanism of skin damage by Environmental irritants, UV rays and pollutants from outdoors and indoors (smoke, gas, particles, heavy metals, ozone and free radicals) are involving the breakdown of skin's collagen and elastin, which is accompanied by hyperpigmentation, inflammation, and dehydration phenomena [3]. The major issues for the skin damage may be due to the inhibition of enzymes like P53 the formation of the free radicals are increased which are majorly involved in the damage of the skin [4]. Even sunlight and radiation also involved in pigmentation due to the production of melanin which is very natural phenomena to protect the skin from the sunlight [5]. Along with the external factor’s microorganisms like *Staphylococcus species*, *Bacillus* and *Escherichia coli* are causing various skin diseases [6]. According to WHO and many other

scientists is doing their research on the plants from the past 10 years. The development of the new discovery of drugs is about 80 % percent based on the plant origin [7].

2. Materials and methods

2.1 Materials

Liquorice Powder, ethanol, concentrated sulphuric acid, glacial acetic acid, sodium benzoate, glycerine, HPMC 50cps, Propylene glycol, Tween 80 distilled water, Ammonia purchased from the sigma Aldrich. Nutrient Agar media was purchased from the Hi media, microorganisms include *Staphylococcus aureus, Escherichia coli, Bacillus subtilis.*

2.2 Extraction of glycyrrhizic acid

Extraction of Glycyrrhizic acid: The liquorice powder (50 g) was mixed with the water, followed by adding sufficient concentrated sulfuric acid until the pH reached 1-2. At a lower pH, the Glycyrrhizic acid was precipitated to remove the other mixtures from the solution, which was subjected to centrifugation for 20 minutes at 4000 rpm. Discard the sedimented precipitate after the centrifugation. The filtrate was collected and its pH adjusted up to 7 by adding ammonia (0.5%). To this solution, add 5 mL of ethanol, which is then subjected to vacuum drying. The obtained glycyrrhizic acid was subjected to phytochemical screening using the foam test [8]. For further identification, TLC was performed by using the mobile phase of butyl alcohol, water, and glacial acetic acid (7:2:1) for isolation and identification. The Rf value obtained for glycyrrhizic acid is 0.416 whereas the standard one is 0.42 [9, 10].

2.3 Formulation of face mask

The formulation of the face mask solution was divided into two phases. The first phase was preparation of the base and the second was mixing of the active ingredients into the base solution. The first phase involves the appropriate above-mentioned substances are mixed in the order including sodium benzoate > glycerine > HPMC> Propylene glycol one by one with the magnetic stirrer at 600-800 rpm for 15 min until all the substances are uniformly mixed properly in a crushed glass motor at room temperature. Make sure that there will be no clumps formation. The second phase is the main phase because the glycyrrhizic acid of 2 mg are mixed through vigorous stirring through the magnetic stirrer. Mix well until a clear solution. The composition of the face mask mixture is shown in Table 1. The prepared solution was sealed in an air tight container. During the usage, the plain face mask sheet was taken and soaked in the solution for about 30 to 60 sec. The mask sheet absorbed the solution then it was ready for usage. Gently apply the soaked sheet on the face for about 20 -30 minutes to obtain the results [11, 12].

2.4 Anti-microbial activity

The anti-microbial activity was evaluated by using the cup plate method. In this method, a bore was made with the help of the sterile boarer and placed the test and standard solutions of 2 µg/ml, 5 µg/mL and 10 µg/mL. Amoxicillin (10 µg/mL) was taken as the standard drug for the study [13,14].

2.5 Evaluation

Various tests are performed on the prepared formulation to identify its organoleptic characteristics, pH, irritancy, compatibility, antimicrobial efficacy and stability as per the standards [15].

2.6 Organoleptic characters

All the organoleptic characters are observed manually to identify colour through visibility, odour through smell and nature by touching [16].

2.7 pH

The pH of the formulation was done by the pH meter manufactured by Labtronics which was calibrated by the buffer solution. Place the electrode in the solution to obtain values of pH. The values were verified in triplicate and average values were calculated [17].

2.8 Irritancy test

The formulated solution was applied to the dorsal surface area of the left hand. Apply the formulation on the 1sq.cm area for a few min. Check the reactions on the skin like irritancy, erythema and edema up to 24 hrs [18].

2.9 Stability:

The face mask solution was stored at different temperatures for up to one month period. After the one-month period, the physical parameters were observed manually if there is any change in the colour odour, pH or any incompatibility i.e. separation of the mixtures [19].

3. Results and discussion

The results show that Fig. 1 was the confirmed test for the saponin glycoside this confirms that the extract contains the saponin glycoside. After the complete

extraction the obtained final compound had undergone TLC which shows the luminescent mark on the TLC plate highlighted with the reagent Vanillin-sulphuric Acid. The spot observed under UV chamber confirms that the compound is the glycyrrhizic acid shown in Fig. 2. Formulated face mask solution is shown in Fig. 3 whereas the composition was represented in Table 1.

Figure 1. Foam test for Saponin glycoside

Figure 2. TLC of glycyrrhizic acid

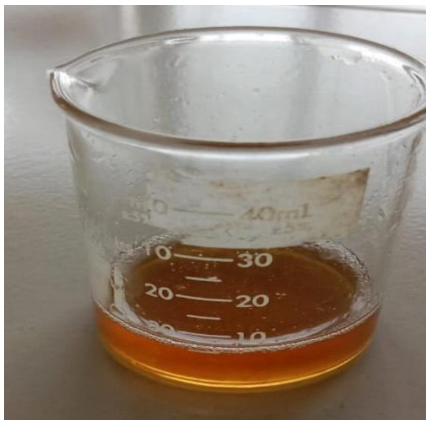

Figure 3. Glycyrrhizic acid based cosmeceutical Formulation

Various parameters were evaluated for the prepared formulation like colour, odour, nature, irritancy, pH, compatibility and stability were observed and represented in Table 2.

Table 1. Composition of face mask solution

S. No	Ingredients	Quantity(10 mL)
1	Glycyrrhizic acid	2.0 mg
2	Honey	1 mL
3	Sodium benzoate	0.1 mg
4	Propylene glycol	1.8 mL
5	HPMC	1.8 mL
6	Tween 80	1.6 mL
7	Perfume	Sufficient

Table 2. Evaluation of glycyrrhizic acid based cosmeceutical face sheet mask

S. No	Parameters evaluated	Inference
1	Colour	Brownish orange
2	Odour	Pleasant
3	Nature	Neutral
4	Irritancy	No
5	pH	6.8
6	Compatibility	Clear solution
7	Stability	No change

The results show that the formulation had brownish orange colour with a pleasant odour and no irritation. The pH of the formulation is 6.8 which is suitable for the skin pH with no incompatibility. In Fig. 4, 5, 6 and 7 shows the minimum inhibitory zone for the respective selected concentrations.

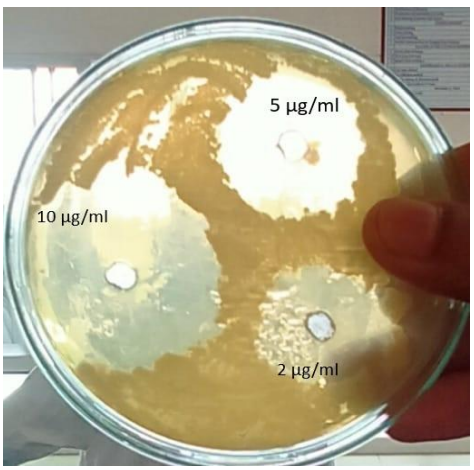

Figure 4. Anti-microbial activity of face mask

Table 3 represents the values of the zone of inhibition which represents the antimicrobial activity shown in Fig. 8. As per Kowalska et al [20], glycyrrhizic acid had significant activity for skin protection against UV light radiation. It also has anti-inflammatory and antioxidant activities which plays a significant role in skin protection. Even though we had the number of formulations containing liquorice which are confined to the crude extract.

Table 3. Anti-microbial activity of glycyrrhizic acid based cosmeceutical face sheet mask

S. No.	Organism	Concentrations (µg/mL)			Zone of Inhibition		
1	*Staphylococcus aureus*	2	5	10	1.2 mm	3.7 mm	5.1 mm
2	*Escherichia coli*	2	5	10	1.6 mm	4.6 mm	6.8 mm
3	*Bacillus subtilis*	2	5	10	3.8 mm	4.9 mm	9.5 mm
4	Amoxicillin	2	5	10	10.5 mm	12 mm	12 mm

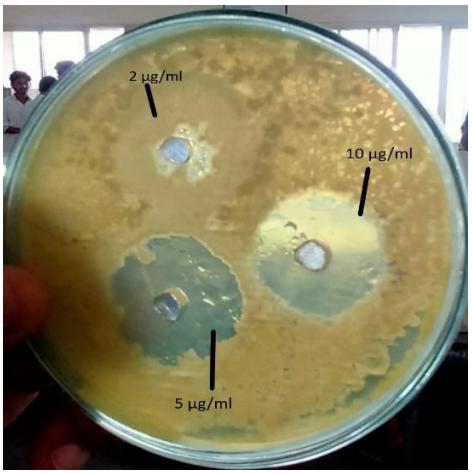

Figure 5. Anti-microbial activity against *Bacillus subtilis* against *Escherichia coli*

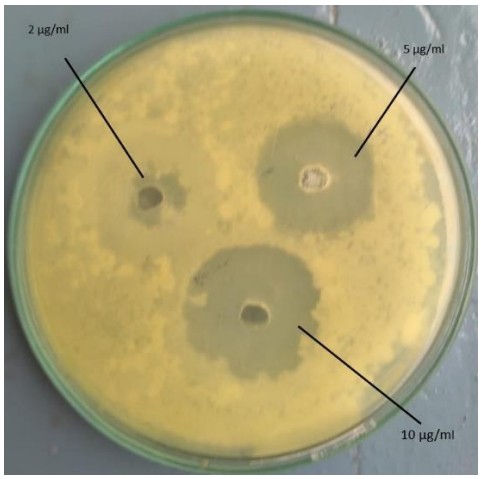

Figure 6. Anti-microbial activity against

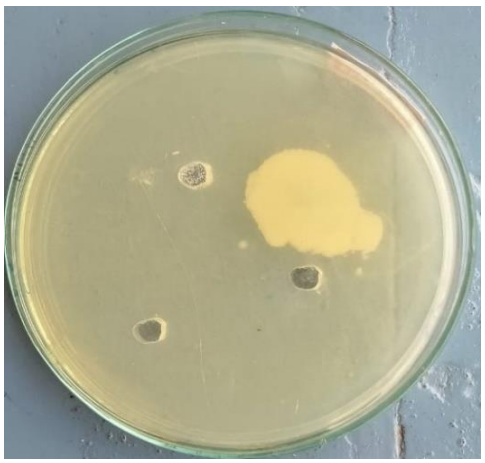

Figure7. Anti-microbial activity of *Staphylococcus aureus* amoxicillin

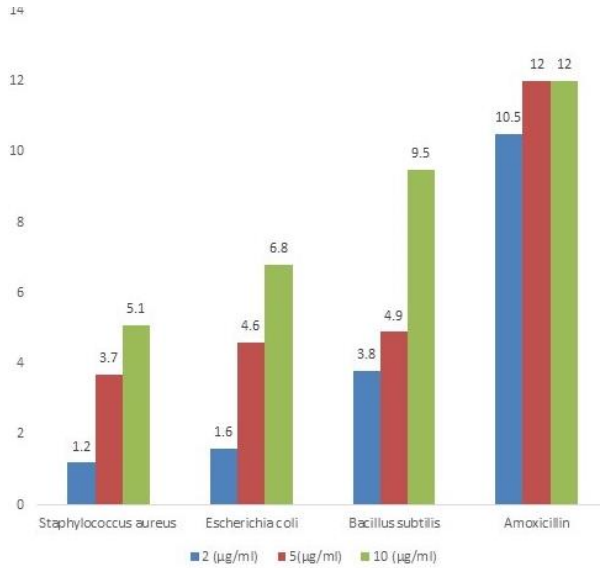

Figure 8: Anti-microbial activity of glycyrrhizic acid containing cosmeceutical facial mask

The isolated compound had a significant therapeutic effect on the skin and easily permeable in nature.

4. Conclusions

The present research was aimed at screening certain medicinal plants, plant products and extracts for their antimicrobial activity and skin care products for easy use and better therapeutic effect, thereby identifying potential plant extracts for further development as safe, effective, affordable, alternative therapeutic agents, most likely new antimicrobials and skin care products. The objectives have been met to an appreciable extent, though further research and efforts are warranted to realize the absolute goal. Most of the plants under investigation showed the presence of several bioactive phytoconstituents in their extracts and were non-toxic. These plants bioactive entities are had likely potential to be developed as safe and effective antimicrobial therapeutic agents. Research should continue in formulating such herbal products like naringin and quercetin compounds along with the other active ingredients that can change the cosmetic field with safety and prevent adverse reactions. The present study aimed the identification

of individual chemical constituents and their effect on skin care. It also proves that the active herbal moieties are underrated as that of the synthetic compounds. As these are very compatible with the human body that reduces the adverse drug reactions. As cancers are increasing globally there should be a need for prophylaxis treatment which can reduce the incidence of cancer. The molecules having anti-oxidant properties are very useful in this era. Nowadays the pollutants and various risk factors of the microorganisms are achieving resistance towards the existing antibiotics in the market. There should be extensive research on this issue where the herbal has a great number of chances for research. This scientific study can serve as an important platform for the development of inexpensive, safe, effective and alternative phytomedicines, especially antimicrobials and skincare.

Authors' contributions

Conceived of the presented idea, C.P. and T.P.; methodology developed and assessed, B.S.C.; supervised the calculations, T.E.G.K.M.; wrote the manuscript, K.P.C.R.

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Availability of data and materials

All relevant data are within the paper and its supporting information files. Additional data will be made available on request according to the journal policy.

Conflicts of interest

The authors have declared that no competing interests exist.

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