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A REVIEW ON POLYHERBAL HYDROGEL FOR DE TAN

Ms. Shilpa Shyam M*[1], Ms. Amaya V V[2], Mr. Muhammed Najad K P [3], Ms. Nabeesath Sahada [4], Ms. Shahala Sharin K P [5].

Department of Pharmaceutics, Malik Deenar College of Pharmacy, Kasaragod, India.

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***Corresponding Author: Ms. Shilpa Shyam M**
Department of Pharmaceutics, Malik Deenar College of Pharmacy, Kasaragod, India.

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ABSTRACT

The work focuses on the formulation of polyherbal hydrogel incorporating liquorice (*Glycyrrhiza glabra*) and neem (*Azadirachta indica*) for effective de tanning and skin brightening. Hydrogels known for their high-water holding capacity, were selected to provide deep hydration and enhanced skin repair following UV exposure. Liquorice extract, a proven pigment lightening and antioxidant agent and neem extract, recognized for sun protective, antioxidant and skin brightening properties, were incorporated using Carbopol 940 as gelling polymer. The prepared hydrogel evaluated for appearance, pH, viscosity, spreadability, washability, stability studies, anti-microbial studies, invitro antioxidant activity, invitro anti thyrosinase activity and invitro SPF determination. Developing herbal hydrogel for de tan using liquorice and neem is safe, stable and effective altermative to commercial de tan products.

KEYWORDS: Hydrogel, Tan, Polyherbal.

INTRODUCTION

The word cosmetic was derived from the Greek word “kosm tikos” meaning having the power, arrange, skill in decorating [1]. The Federal Food, Drug and Cosmetic Act (FD&C Act) defines cosmetics as "articles intended to be rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body for cleansing, beautifying, promoting attractiveness, or altering the appearance"; as well as any substance intended for use as a component of a cosmetic product [2].

Tanning is a highly worldwide known skin concern. While it is not that much dangerous, without enough protection prolonged sun exposure can lead to skin damage. The skin's

natural defence against UV damage is tanning. When UV rays penetrate, it leads to generate a reddish-brown pigment pheomelanin. It results in tan, darkening of skin. Specialized cell in the lower layer of skin melanocytes produces the pigment melanin, leads to tanning. Skin darkening by sun exposure called as “sunbathing” or “tanning”. The ultraviolet (UV) light from the exposure of sun or artificial sources were the main cause of tanning [3]. Immediate Tanning is a quick tan occur within minutes of UV exposure and fades fast in hours to a day. Minimal protection. Delayed Tanning appears hours later and lasts days or weeks. Increased melanin production protects skin, more substantial tan [4]. Several serious health risks can be caused by sun exposure and tanning such as skin cancer, sun burn, premature aging, weak immunity and eye diseases [5]. Chemical peels, Microdermabrasion, Chemotherapy and Laser treatment are the tan removal treatments. Tan Removal gels and creams with Lightening Actives, De tan face pack, and exfoliation products are now adays commercially available as skin care products for tan removal [6].

De-tan, refers to the skincare products or treatments that are intended to eliminate undesired sun damage or tan from the skin, leaving it with a natural shine and a more even tone . The common therapies involve the application of physical sunscreen alone or in combination with topical decolorizing agents. They aim to exert therapeutic effects by reducing melanin synthesis or transfer and attenuating oxidative stress response [7].

Gels are defined as semi rigid systems in which the movement of the dispersing medium is restricted by an interlacing particle of three - dimensional network or solvated macromolecules of the dispersed phase [8]. Most people do not know the long-term consequence of using the commercial gel is the main problem. This is because these commercial products contain ingredients which could harm the body in the future. Herbal gel is a natural alternative to conventional gel that is made of using botanical herbs and plant-based ingredients. The rising popularity of herbal gel can be due to its skin-friendly and environmentally conscious characteristics.

Hydrogel is best for de tan as it gives advantages of gel and deep hydration, which might be beneficial for irritation and dry skin caused by excessive sun exposure. A hydrogel, is an organized network of insoluble polymer chains that can hold a large amount of water within its structure. It is often viewed as a colloidal gel where water acts as the dispersion medium [9]. Liquorice is a well-known pigment lightening agent having antioxidant property and neem have antioxidant, skin brightening and sun protective effects [10].

REVIEW OF LITERATURE

1. ***Karan Atpadkar et al (2025)*** formulated aloe vera herbal hydrogel. The aim was to develop a stable natural skincare hydrogel utilized to oversee skin related problems [9].
2. ***Rishu Yadav et al (2025)*** formulated herbal hydrogel combining Aloe vera and Flaxseed. The aim was to develop a stable, multifunctional natural skincare hydrogel that leverages the skin-soothing, moisturizing, antioxidant and anti-inflammatory benefits of Aloe vera and flaxseed for enhanced skin health.
3. ***Tilotma sahu (2024)*** formulated a kojic acid and nicotinamide-loaded hydrogel using Carbomer and triethanolamine, assessing its physicochemical properties, drug release, and stability. The aim was to develop a stable, effective anti-tan topical hydrogel with improved absorption and controlled drug release [22].
4. ***Antonietta Cerulli et al (2022)*** reviewed and Their Constituents as Active Cosmeceutical Ingredients. It focuses *Glycyrrhiza* spp. along with their cosmeceutical activities categorized as skin anti-aging, photoprotective.
5. ***Prity Rathee et al (2021)*** conducted study on skin hyperpigmentation and its treatment with herbs. The conclusion includes Azadirachta indica, Glycyrrhiza glabra, quercetin, are very useful in herbal cosmetic as anti-hyperpigmentory agents. Flavonoids and triterpenoids in plants show their effect as antioxidant and skin whitening agents [10].
6. ***Manisha Yogesh Sonalkar et al (2016)*** formulated polyherbal cosmetic cream. It concluded that on combining the extract Glycyrrhiza glabra root, Carica papaya leaves & Azadirachta indica leaves give multipurpose effects such as whitening, antiwrinkle, antiaging and sunscreen effect on skin [14].

POLYHERBAL HYDROGEL

Hydrogels are water swollen three dimensional structures composed of primarily hydrophilic polymers. Herbs such as liquorice and neem are used as active pharmaceutical ingredients for action on the skin. Hydrogel is typically formulated to offer a combination of skin lightening, brightening, removing dead skin cells and deep hydration.

INGREDIENTS

1. **LIQUORICE** (*Glycyrrhiza glabra*)

- Kingdom: Plantae
- Division: Angiospermae
- Class: Dicotyledoneae

- Order: Rosales
- Family: Leguminosae
- Genus: Glycyrrhiza
- Species: glabra Linn [11].

Fig. 1 – Liquorice root.

Benefits:

- ❖ The extracts of liquorice, reported as an effective pigment-lightening agent. It is the pigment-lightening agent known to be safe with least side effects.
- ❖ Phytochemicals from the plants shows beneficial action related to UV protection on the skin, antioxidant action, matrix protection, and skin hydration [12].

2. NEEM (*Azadirachta indica*)

- Kingdom: Plantae
- Division: Angiospermae
- Class: Dicotyledoneae
- Order: Rutales
- Family: Meliaceae
- Genus: Azadirachta
- Species: indica [13].

Fig. 2 – Neem leaves.

Benefits:

- ❖ Parts of Azadirachta indica, proven good potential to be used for sun protective effect. It is also used to it reduce the redness, itching of irritated skin.
- ❖ It reduces the scar & pigmentation.
- ❖ It offers antioxidant and skin lightening activity [14].

3. CARBOPOL 940

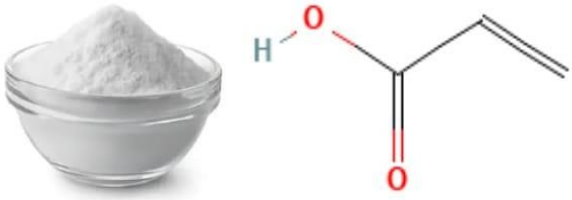


Fig.3 – Carbopol 940.

- Soluble in water; after neutralization, soluble in 95% ethanol and glycerin.
- Application: It is an extremely efficient rheology modifier capable of providing high viscosity and forms sparkling clear gel or hydro-alcoholic gels and creams [15].

4. GLYCERIN

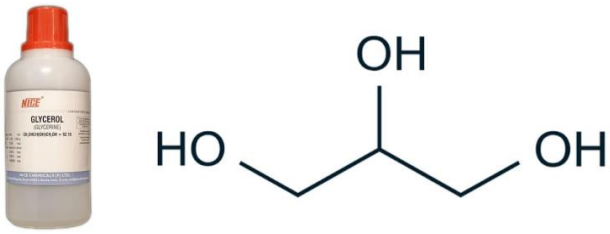


Fig. 4 – Glycerin.

- Synonym: Glycerol.
- Miscible with phenol, glycol, propanediols, amines, and heterocyclic compounds containing nitrogen atom in ring.
- Application**:** Glycerin used as a denaturant, fragrance ingredient, humectant, skin protectant and viscosity decreasing agent [16].

5. PROPYLENE GLYCOL

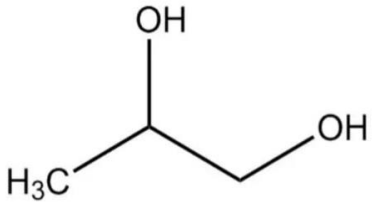


Fig.5 – Propylene glycol.

- Solubility: water, acetone and chloroform miscible; Soluble in ether.
- Application in pharmaceutical formulation: Propylene glycol is widely used in pharmaceuticals as a solvent, humectant and penetration enhancer [17].

6. TRIETHANOLAMINE

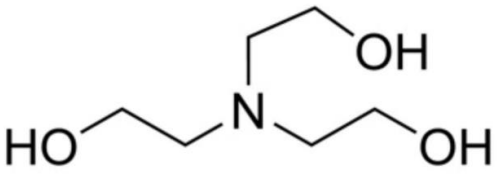


Fig.6 – Triethanolamine.

- Synonym: Trolamine
- Solubility: Miscible in water.
- Application in pharmaceutical formulation: Used primarily in making surfactant, such as for emulsifier [18].

7. PHENOXYETHANOL

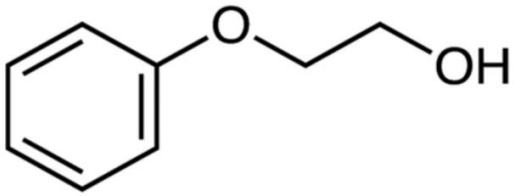


Fig.7 – Phenoxyethanol.

- Solubility: Freely Water soluble, Alcohol, Acetone.

- Application: Phenoxyethanol is effective in preventing the growth of harmful bacteria and fungi, and it has broad-spectrum antimicrobial activity, making it an ideal choice for cosmetic products [19].

8. ROSE WATER

Fig. 8 – Rose water.

- Synonym: Attar rose
- Rose water is flavoured water made by steeping rose petals in water. It is the hydrosol portion of the distillate of rose petals, a by-product of the production of rose oil for use in perfume. Rose water is also used to flavor food, as a component in some cosmetic and medical preparations [20].

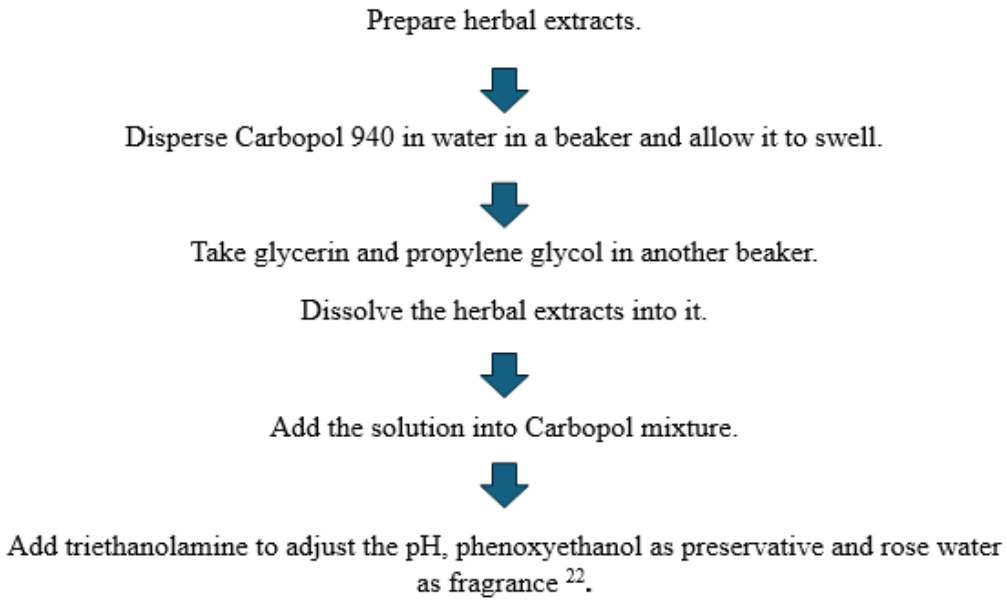
ADVANTAGES

- Biocompatibility: non-toxic and compatible with living tissues.
- More water Content: About 90% water content, mimicking natural tissues.
- Controlled Drug Release.
- Patient Compliance enhanced: Easy administration and minimize side effects.
- Soft, flexible and biodegradable.
- Porous Structure: Allows cell growth and tissue ingrowth.
- Stimulus Responsive: Responds to environmental changes.

DISADVANTAGES

- Limited Mechanical Strength.
- Stability and Shelf Life is limited.
- Potential for Gelation or Precipitation [21].

METHOD OF PREPARATION



EVALUATIONS

- Appearance and Homogeneity
- pH determination
- Viscosity determination
- Spreadability Test
- Washability
- Swelling index
- Stability studies
- Invitro antioxidant activity
- Invitro SPF determination

CONCLUSION

The formulated polyherbal gel containing liquorice and neem proved to be a promising natural skincare formulation for de tanning and skin brightening. The herbal extracts enhanced antioxidant activity, anti-tyrosinase activity and potential sun protective benefits, supporting their role in reducing pigmentation and repairing UV induced skin damage. Overall, it is concluded that the combination of liquorice and neem in a hydrogel base provides an effective, safe and eco-friendly alternative to synthetic commercial products.

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