

FORMULATION AND EVALUATION OF PHOTO-AGING FACE GEL BY USING ALGAE POWDER EXTRACT (CHLORELLA VULGARIS)

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Abstract

The main objective of the present study was to prepare a photo-aging face gel by using algae powder extract (Chlorella Vulgaris). Photo-aging means it is premature aging of the skin. Photo-aging face gel helps to remove or reduce premature aging of skin or skin problems by using algae powder extract. Algae is a rich source of antioxidants, carotenoids, pigments, etc. there is a different category of algae are used in many cosmeceuticals, nutraceuticals preparations such as microalgae or macroalgae. It is a natural marine source, in this work, Chlorella Vulgaris is used to treat against anti-aging or skin problems. Chlorella Vulgaris is a huge source of proteins, minerals, phenol, tannins, terpenes, terpenoids, flavonoids, and vitamins. The main source is anti-oxidants like α and β carotene which help to defend against the skin from photo-aging and wrinkles. Photo-aging is the common skin problem that 80% of teenagers face today. In this study, face gel was prepared using algae powder with distilled water extract by decoction method. There are different types of methods of extraction are used to prepare extract but Decoction is newly processed to prepare algae powder extract.

Keyword: Photo-aging, Anti-oxidant, Carotenoids, Humectant.

1. INTRODUCTION

Skin aging is a continuous deterioration process of damage to cellular DNA and protein. It is classified into two types i.e. photo-aging and sequential skin aging.

Both types have distinct clinical and historical features. Photo-aging is the result of premature aging of the skin. Photo-aging is also known as Extrinsic aging, it differs from chronologic aging; the damaging effects of UV rays from the sun or artificial tanning sources alter normal skin structures. Aging is a complex, progressive process that leads to changes occur in the skin. This process can result from intrinsic as well as extrinsic processes. It occurs most visible parts of the body i.e. face, neck, and back of the hand.

Signs of Photo-aging,

- Spider veins on nose, cheeks, and neck
- Pigmented spots on the skin (red scaly spots)
- Loss of skin tone and elasticity

Some risk factors for photo-aging includes older people, male sex, skin types I and II, or high occupational sun exposure or sun irradiation.

Generally, marine natural products are very good to treat some skin problems because it is same as botanical products. Both are the same as natural cosmetics products. They do not cause any side effects or non-irritant to the human body; instead, they enrich the body with nutrients and other useful minerals. Chlorella Vulgaris is green microalgae mainly used in food supplements or cosmetics. It is a rich source of Anti-oxidant capacity containing α and β carotenoids and other essential constituents that are used to treat photo-aging or other skin related problems. Chlorella Vulgaris contain some Pharmaceutical activity like anti-oxidant, anti-aging, moisturizing, Humectant, and preservative. Anti-oxidant is an important activity can prevent or

reduce aging of the skin or one more it is work against reducing oxidative damage of products. There are different types or category of algae are used to prepare cosmetic preparation like creams, lotion, etc.

2. MECHANISM

The sun is an essential part of our life. Besides it also playing a key role in the synthesis of vitamin D which is good for health purposes but, it also produces UV radiation which produces free radicals and causes cell damage. Aging and Wrinkles are natural. As people get aged, their skin gets thinner, drier, and less elastic, and less capable to defend itself from damage. This leads to crinkles, and lines on the skin. Collagen is the main building block but, UV light breaks the collagen and elastin fibers in the skin. There are two important factors of collagen production as one is transforming growth factor(TGF) and the other is activator protein(AP-1). TGF is promoting collagen production and AP-1 inhibits the remodeling of collagen production. After collagen breakdown by up-regulating enzymes called matrix metalloproteinase(MMPs). When skin is exposed to sunlight, UV radiation is absorbed by skin molecules that can generate harmful compounds, called reactive oxygen species (ROS). Which causes oxidative damage to the skin. ROS is an important role in molecular pathways. it can help to increase MMPs production, with subsequently increased breakdown of collagen

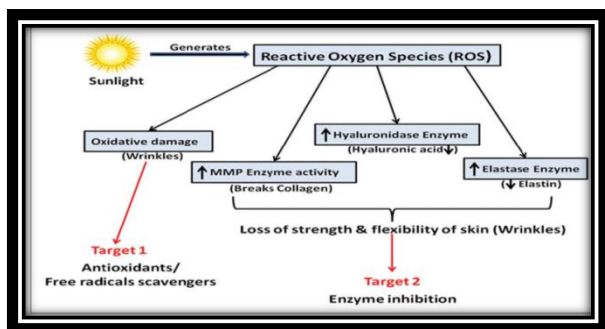


Fig-01 Mechanism action of Aging

2.1. Extract use for Photo-aging, Anti-aging and Anti-wrinkle Purpose

The algae is a rich source of vitamins and anti-oxidants like α and B-carotene, α carotene which helps protect the skin from aging, wrinkles, skin discoloration, dark

circles. It contains high moisturizing properties and acts as humectants. Vitamins and Anti-oxidant like B-carotene are increases the production of collagen and elastin to prevent wrinkles and skin aging concerning the main action against Photo-aging.

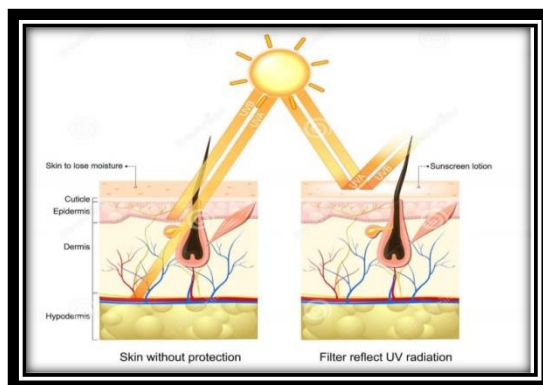


Fig-02 Skin without protection and Filter reflect UV radiation

2.2. benefits of Photo-aging face gel

- It can help to easily reduce photo-aged skin.
- Nourish the skin.
- Improves skin texture.
- Soothes sunburn.
- Protects the body from sun rays.

2.3. Active Profile

2.3.1. Algae

Algae is the natural product act as photoprotection. It is the secondary metabolites produced by living organisms found in nature. Algae are the prolific source of many bioactive such as phlorotannins, carotenoids, polysaccharides, and mycosporine-like amino acids (MAAs) with the potential development of nutraceutical, cosmeceutical, or pharmaceutical products.

Algal can be divided as, Unicellular (microalgae) and Multicellular (macroalgae), also known as seaweed.

- Micro-algae: This is also known as blue-green algae or cyanobacteria are prokaryotic, microscopic unicellular algae.
- Macro-algae: Macro-algae is eukaryotic, macroscopic multicellular algae, widely known as

seaweeds. Macro-algae can be divided into three major groups such as,

1. Chlorophyceae (Green algae)
2. Phaeophyceae (Brown algae)
3. Rhodophyceae (Red algae)

2.3.2. Green algae

It is also known as Chlorophyceae. It produces photosynthetic pigment chlorophyll, which can trap light energy. This provides oxygen to the exposed surface of the algal species and prevents it from drying by moisturizing it.

2.3.3. Chlorella Vulgaris

Chlorella Vulgaris is a green microalga .it is found either singly or clustered in fresh or saltwater and soil. It is a rich source of vitamins, proteins, pigments. Scientific classification Chlorella V.



Fig:-03 Chlorella Vulgaris

2.4. Taxonomy

Kingdom	Plantae
Sub-Kingdom	Viridiplantae
Superdivision	Chlorophyta
Division	Chlorophyta
Class	Trebouxiophyceae
Order	Chlorellales
Family	Chlorellaceae
Genus	Chlorella

Species	<i>C. Vulgaris</i>
Synonyms	Chlorella

2.5. Phytoconstituents

According to a literature survey of Chlorella Vulgaris algae showed the presence of carotenoids, palmitic acids, phenols, terpenoids, tannins, fats, proteins, minerals, etc. Chlorella Vulgaris contains α and β large quantity of carotenoids and other vitamins, and minerals. Anti-oxidant capacity is present in α and β carotenoid which are helps to increase collagen synthesis to help to reduce photo-aged skin.

3. AIM

Formulation and Evaluation of Photo-aging face gel by using algae powder extract (Chlorella Vulgaris).

4. OBJECTIVE

- The objective of the present study is to prevent photo-aging effect on the face.
- To study the role of algae powder extract to prevent the photo-aging effect.
- To assess the efficacy & tolerability of face gel to improve the appearance of aging, wrinkles, fine lines, etc.
- To nourish and beautify the skin.
- To reduce the rate of premature aging.
- To check the Anti-oxidant capacity of Extract.

5. METHODOLOGY

The method or procedure to formulate a photo-aging face gel is not complicated or tough. A proper method has to be carried out while formulating the photo-aging face gel are as,

1. Selection of active
2. Procurement of algae powder
3. Extraction Method
4. Materials

5. Selection of base
6. Formulation
7. Preparation
8. Evaluation

5.1. Methods

5.1.1. Selection of active

As per the literature survey, *C. Vulgaris* is the eukaryotic microalgae that contain some Pharmacological activity and it contains some useful phytochemical constituent like Polysaccharides, Palmitic acid, lipids, vitamins, antioxidants, carotenoids, preservatives.

5.1.2. Procurement of algae powder

It is procured by, Cherish Pharma N-42 CE3/31-3, Shivshakti Nagar near Trimurti Chowk, Jagtap Nagar, Nashik- 4222008, Maharashtra, India.

5.1.3. Extraction method

Decoction method is performed,
Decoction :

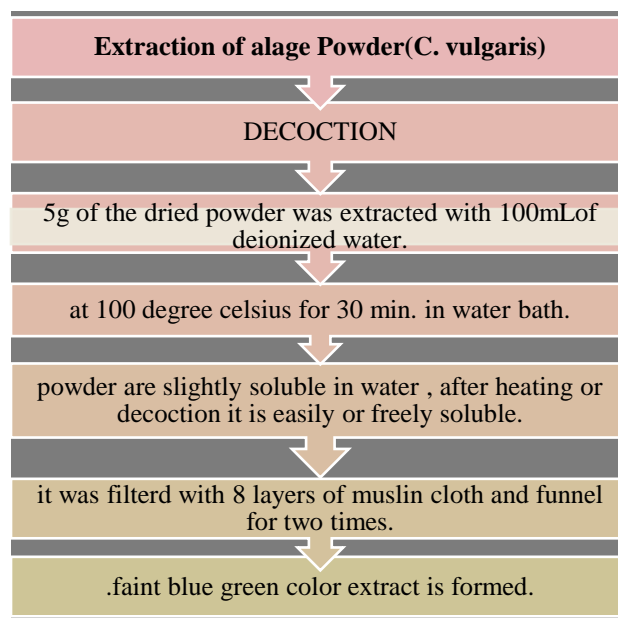
A Concentrated liquor resulting from heating or boiling a substance, especially a medicinal preparation made from plant or other sources. (Marine sources)



Fig C. Vulgaris bulk



Fig.10 Extract (Filtration)



5.1.4. Materials

Different agents used in this study Algae powder extract are used to treat the photo-aging problems. This algae powder can be purchased from Cherish Pharma, Nashik. The other ingredients include Carbopol 940, Aloe vera extract (gel), TEA, Glycerine, Color, Perfume Can Purchase from Various cosmetic industry.

5.1.5. Selection of base

Thickeners are used to prepare a gel base. i.e. Gelling agent. These agents are used to increase or decrease the viscosity of a liquid either to serve as adjacent to improve pour-ability. They are known as "Thickening agents". Many thicknesses are polymers.

Examples of Thickeners or Gelling agents such as,

1. Carbopol 940
2. Xanthan gum

In this preparation, carbopol is used to prepare gel Because Carbopol contains good consistency, and gel becomes whiter or clear. Xanthan gum also good for preparing gel, Because it is Natural Thickener or Gelling agent, but its consistency not good. (faint yellow color

gel forms) Hence, Carbopol is used to prepare Photo-aging Face gel.

Carbopol 940: INCI Name – Carbomer

Carbomer 940 polymer is a white powder. It is an very effective rheology transformer accomplished of providing great viscosity and forms shiny pure gels or hydro-alcoholic gels and creams.

Features / Benefits

- Compatible with other materials used in styling gels.
- High viscosity builder and stabilizer.
- It provides clarity and high suspending ability in gels.
- It provides high clarity.
- Short flow rheological characteristics.

5.2. Formulation of Photo-aging face gel

Ingredients	Category	Qty%
c. vulgaris	Anti-aging, Anti-Oxidant Anti-Wrinkles	5
Aloe vera extract	Moisturizing agent	5
Carbopol 940	Gelling agent	0.8
Triethanolamine	Neutralizer	1.2
Glycerine	Humectant	5
Color	appearance	Qs
Distilled water	Vehicle	79.6
Perfume	fragrance	4 drops

5.4. Preparation of Gel base

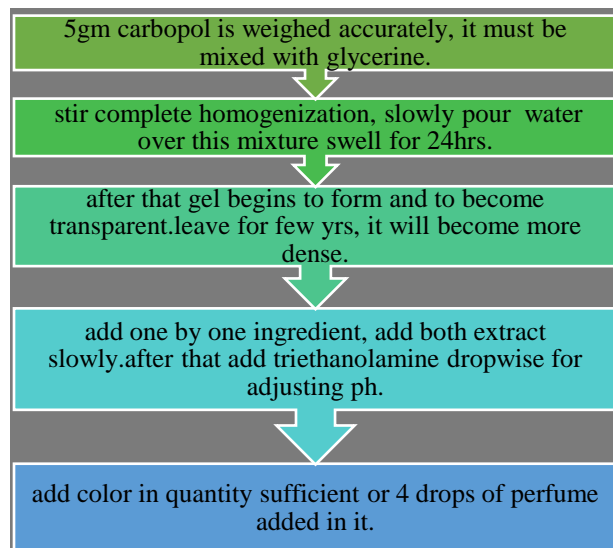


Fig: 07 Formulated Photo-aging Face gel

5.5. Benefits of an Extract

1. Anti-aging and anti-oxidant
2. Phlorotannins with potential antioxidant and radical scavenging activities.
3. Preservative
4. Moisturizing and hydration action
5. Collagen boosting
6. Photo-protective action
7. Carotenoids are important natural lipid-soluble pigments that directly provide photoprotection against UV light-induced oxidation in the skin.
8. Anti-inflammatory
9. Antibacterial
10. Whitening / Melanin inhibiting effects

5.6. Mechanism of algae on skin

- Algae as Anti-oxidants.

- Anti-oxidants are chemicals that transfer electrons to an oxidizing agent providing glowing skin by preventing skin damage.
- Algae is a rich source of anti-oxidant. An anti-oxidant helps in skin tightening, reduction of wrinkles and reduces inflammation.
- Carotenoids are fat-soluble accessory pigments that help algae to harvest light in conjunction with chlorophyll to carry on the reaction of photosynthesis or treat the problems of the skin.
- Vitamin C and Vitamin A serve as natural anti-oxidants.

6. EVALUATION OF PHOTO-AGING FACE GEL

6.1. pH

1.0 g. the gel was accurately weighed and dispersed in 100 ml. purified water. The pH of the spreading was determine by a digital pH meter. The glass electrode was calibrated with the solution determined for the equipment.

6.2. Spreadability

One of the standards for a topical formulation to fulfill the perfect qualities is that it should possess good spreadability. it's the term expressed to denote the extent of the realm to which formulation readily spreads on application to the skin or affected part. The beneficial value of a preparation similarly be determined by upon its dispersion worth. To define the spreadability of preparation, 0.5 g of the gel was placed within a circle of 1cm width premarked on a glass plate/slide of 20 by 20 cm, over which a second glass plate was placed. the rise within the diameter because of gel spreading was noted.

$$S = m \times 1/t$$

S=Spreadability

m=Weight placed on the slide

l=Length of the glass slide

t=Time taken in seconds

6.3. Extrudability

To define extrudability, a locked folding tube containing preparation was pushed firmly at the wavy end. When the cap was removed, preparation extruded until the

stress dissipated. Weight in grams required to extrude a 0.5 cm ribbon of the formulation in 10 s was firm. the common extrusion pressure in g was reported. it had been found to be 15.3 g/cm²

6.4. Viscosity

The thickness of the various gel designs was firm at 25°C using Brook field viscometer apparatus DV2T model. The gel sample (5g) was placed within the sample holder of the viscometer and permitted to accept 5 min, and also the viscosity measured a rotating speed of fifty rpm at temperature (25–27°C). The viscosity was found to be 168-169 centipoise.

6.5. Irritability

a tiny low amount of gel was applied externally on the skin surface for some minutes and checked for reactions on the skin. it had been found to be non-irritant.

7. EVALUATION PARAMETER

Sr. No	Parameters	Observation
1	Color	Faint green
2	Odor	Characteristics
3	Consistency	Good
4	pH	5.7
5	Viscosity	168-169cp
6	Spreadability	Good
7	Homogeneity	Non-homogeneous
8	Irritancy	Non-irritant
9	Extrudability	15.3±1.2 g/cm ²

8. RESULT

Photo-aging face gel was prepared and evaluated. It contains a Water base extract of Chlorella Vulgaris powder which possesses antioxidant, anti-aging, and anti-wrinkle skin tightening lightening and Moisturizing property. They can Moisturize the skin with its application. Suitable base materials such as gelling

agent, preservative, neutralizer, and were selected and incorporated into the extract to design a suitable gel. Evaluation parameters such as color, odor, consistency, and pH were checked.

9. CONCLUSION

The current work was done to prepare a Photo-aging preparation using an appropriate base to form a gel. The prepared gel was evaluated using various parameters and was found to be satisfied with the application on the skin to make it healthy and effective without any side effects. Since *Chlorella Vulgaris* are natural anti-aging and anti-wrinkle agents, they are incorporated into the formulation which increases the efficiency of the product.

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