

# A Comprehensive Review on Herbal Under-Eye Creams for the Management of Periorcular Hyperpigmentation (Dark Circles)

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**Abstract:** Periorcular hyperpigmentation, popularly referred to as dark circles, is a common cosmetic problem affecting people of all ages. There are several causes like genetic predisposition, aging, stress, lifestyle factors, and environmental triggers that may lead to dark circles. The present review aims to elucidate the application of herbal medicines in dealing with dark circles with special consideration to their safety and effectiveness compared with synthetic compounds. The use of natural herbs such as *Clitoria ternatea*, *Aloe vera*, *Phyllanthus emblica* (amla), *Cucumis sativus* (cucumber), and potato starch is associated with antioxidative, anti-inflammatory, and skin-lightening capabilities. Such bioactive constituents will assist in minimizing the darkness and enhancing skin moisturization and smoothness.

**Keywords:** Herbal cosmetics, dark circles, periorcular hyperpigmentation, aloe vera, antioxidants, under-eye cream

## I. INTRODUCTION

The eye is one of the most complicated organs of the human body. It consists of three layers. The first layer of the eye is comprised of the cornea and the sclera. The second layer is made up of the iris, the ciliary body, and the choroid. The third and innermost layer is known as the retina. The cornea assists in the process of focusing light and directing it inside the eye. The sclera helps in adding strength to the eye. The function of the second layer is to regulate the amount of light entering the eye and provide nutrients to the retina (1).

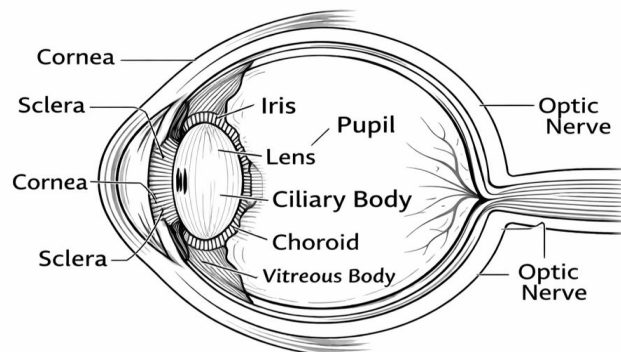


Fig. 1: Anatomy of the Human Eye (1)

The skin surrounding the eyes is extremely delicate and contains very little subcutaneous fat in comparison to other facial regions, hence leading to premature symptoms like swelling, lines, and skin pigmentation. Periorcular



hyperpigmentation, popularly referred to as dark circles, can be caused by numerous aspects such as stress, fatigue, pollution, genetics, and elevated levels of melanin formation. It is among the most prevalent issues in cosmetology and affects people of various ages (2, 3).

## **II. ETIOLOGY AND PATHOPHYSIOLOGY OF DARK CIRCLES**

- Melanin Hypersecretion
- Thinning of Periorbital Dermis
- Blood Vessel Expansion
- Biological Aging Process

It is essential to understand facial anatomy in determining the causes of infraorbital hyperpigmentation, popularly referred to as dark circles. There are numerous anatomical and physiological factors that may trigger dark circles, such as the facial ligamentous structures, bone architecture, soft tissue composition in the mid-face region, orbicularis oculi muscle, and blood vessel system. Furthermore, the eyelid skin is very thin and has little subcutaneous fat, thus increasing the chances of pigmentation (4).

The aging process affects the bones, ligaments, and soft tissues, contributing significantly to dark circles. This causes volume loss and increases the visibility of the blood vessels under the eyes (5). Even though dark circles are not considered a clinical condition, they may be an indicator of other diseases. Nevertheless, most individuals have dark circles due to poor lifestyle choices like lack of sleep, stress, hereditary factors, and biological aging (6).

## **III. WHAT CAUSES DARK CIRCLES?**

Dark circles may be caused by several physiological and environmental factors. Some of the most common causes of dark circles are insufficient sleep, hay fever, and hyperpigmentation, which is caused by an excess of melanin production (7).

Furthermore, the thinning of the skin around the eye area coupled with a decrease in fat underneath the skin causes the blood vessels under the skin to become more prominent. Other potential causes include anemia, especially when caused by iron deficiency, excessive exposure to the sun, repeatedly rubbing the eyes, and the natural aging process. Smoking and dehydration are two habits that can further exacerbate dark circles (8).

## **IV. APPROACHES TOWARDS CARE AND TREATMENT**

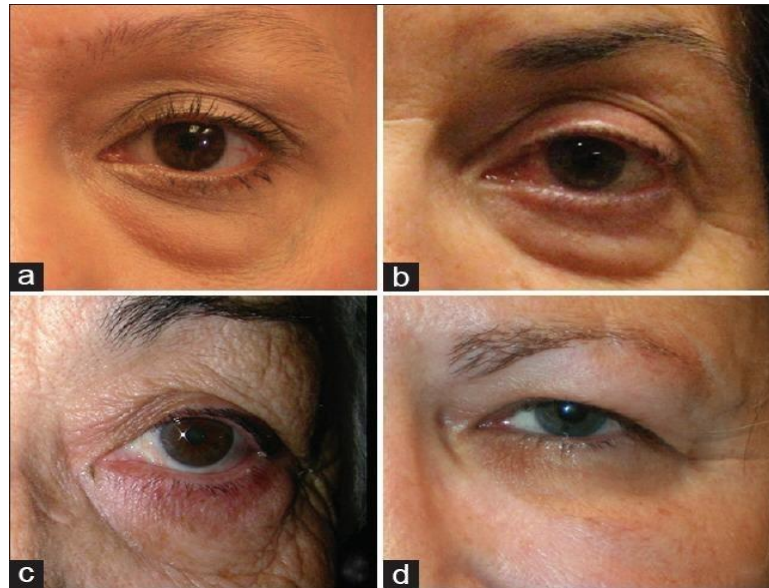
The treatment of dark circles is mainly focused on making certain lifestyle changes and implementing non-medical solutions. It is important that one gets enough sleep, at least 7 to 8 hours of sleep, to ensure that the formation of dark circles is avoided. The use of a cold pack has proven effective since it leads to vasoconstriction.

Cucumber slices and tea bags that are cooled are popular home remedies for dark circles because of their moisturizing qualities, antioxidants, and circulation promotion properties. Besides, massaging the face around the eye region increases blood flow in the area, which might contribute to reducing dark circles (9).

## **V. LIGAMENT AND BONE STRUCTURE UNDER THE SKIN**

Ligament structure and bone structure are necessary elements that provide support for facial soft tissue and maintain the normal anatomical contours of the face. In the course of aging, certain structural alterations occur within the midface zone. One such alteration is the retraction of the orbital bone. Another alteration involves the reduction of the malar bone volume. The result of these structural changes is the increased tension of the orbital retaining ligaments and the movement of the soft tissue, which produces shadowing and causes the development of infraorbital dark circles (10, 11).





**Fig. 2:** Underlying ligament and bone structure (10)

#### VI. FUNCTIONS OF UNDER-EYE CREAM

Under-eye creams are formulated particularly for the area under the eyes due to its sensitive nature. The main functions of under-eye creams involve moisturization, fighting the symptoms of aging like wrinkles, and lightening the skin through reduction of pigmentation. They also aid in reducing any puffiness through inflammation reduction and elimination of excess fluids, as well as soothing any irritated skin (12).

Apart from that, under-eye creams shield the skin from damage caused by environmental conditions like UV rays and ensure proper nourishment of the skin (13).

#### VII. HERBAL COSMETICS

Herbal cosmetics, commonly known as natural cosmetics, are highly popular because of their safety, efficiency, and negligible side effects. The composition of these cosmetics includes herbal plants, which include beneficial substances such as flavonoids, vitamins, and antioxidants, which can nourish and rejuvenate the skin (14).

The common herbal cosmetics include herbs like aloe vera, neem, turmeric, and other natural plant extracts (15). Depending upon their application, these cosmetic products are divided into two major categories: medicinal and non-medicinal.

These products find extensive usage in solving numerous skin problems, including skin aging, hyperpigmentation, dark spots, and skin discoloration issues (16).

#### VIII. DEFINITION AND CLASSIFICATION OF CREAMS

Creams are semisolid preparations consisting of both an oily component and a watery component, which form O/W or W/O emulsions. They find wide application in the cosmetics and pharmaceutical industries in treating topical problems associated with the skin (17).

The advantages of using creams include moisturizing, protecting, and healing effects. Based on their compositions, they can be classified as follows (18):

O/W Creams – They are less greasy, easily washed off, and more acceptable cosmetically.

W/O Creams – They are more occlusive and have more moisturizing properties.



They may further be divided depending on their uses. There are cleansing creams, cold creams, foundation creams, and under-eye creams, among others. Under-eye creams, as their names suggest, are applied around the eyes to take care of problems around the periorcular regions like dark circles and wrinkles (17, 18).

### **IX. COMMERCIALY AVAILABLE UNDER-EYE CREAMS**

There are many commercially available under-eye creams that can help in treating conditions like dark circles, eye puffiness, and wrinkles. Some of the ingredients in these creams can be both natural and artificial and include vitamins, antioxidants, peptides, and hydrating components (19).

Some common commercially available under-eye creams are the following:

- Mamaearth Bye Bye Dark Circles Under Eye Cream
- Pilgrim 4% Vitamin C Brightening Under Eye Cream
- Olay Eyes Ultimate Eye Cream
- Himalaya Herbals Under Eye Cream
- VLCC Almond Under Eye Cream

Though these under-eye creams are highly popular, it should be remembered that there could be some formulations that might have some artificial ingredients that can irritate the skin of some people (20).

### **X. BENEFITS OF HERBAL CREAMS**

Herbal creams possess various benefits since they are made of natural products. Generally, these products are safe, effective, and applicable in long-term use (20).

The application of such creams helps to minimize swelling under the eye area while improving the condition of the skin around them through moisturization and nourishment. The presence of active substances in herbal creams allows them to brighten and improve skin condition (21). As opposed to artificial creams, herbal creams are much safer for skin application and rarely cause irritation since their ingredients are not aggressive. These creams fit most skin types and promote healthy skin appearance and glowing skin appearance (22).

### **XI. DRAWBACKS OF ARTIFICIAL CREAMS**

While being effective products, artificial creams can cause some skin conditions, which are undesirable to experience. One such condition is skin irritation, dryness, and increased skin sensitivity caused by long-term artificial cream application (20).

Sulfate, for instance, can strip away the natural oils from the skin making it drier, thus damaging it. Alcohol used in artificial creams can increase the rate of dehydration of the skin and cause some health issues. Preservatives such as parabens can have negative effects on the skin when applied (21, 22).

### **XII. PROCESSING OF HERBAL FORMULATIONS**

Herbal substances and their formulations have gained considerable importance in international business due to their pharmaceutical significance and economic benefits. The processing of herbal substances usually follows two stages, namely, primary processing and secondary processing (23).

The initial stage of primary processing comprises elementary processes like cleansing, sorting, pulverizing, dehydration, and grinding of plant tissues. Such measures aim at eliminating impurities from the herbal material and preparing the substrate for subsequent operations.

The secondary stage emphasizes the refinement of herbal substances using sophisticated methods like extraction, isolation, and formulation, ensuring the enhancement of their therapeutic efficacy and reduced toxicity. In this regard, the herbal substances undergo transformation into various forms, including powder form, extract form, tincture form, essential oil form, decoction form, and infusion form. Such intermediate products aid in preparing final herbal formulations, which are useful in medicine or cosmetology (24).



The final formulations incorporate one or more herbal substances and are commonly prepared as polyherbal formulations.

### **XIII. DIFFERENCES BETWEEN HERBAL AND ALLOPATHIC UNDER-EYE CREAMS**

There exist marked differences between herbal and allopathic under-eye creams in terms of their components, mode of operation, and outcomes. The main components of herbal products include natural herbs like aloe vera, cucumber, turmeric, green tea, and almond oil. Such products act gradually, enhancing skin condition through time, and are safe to be used daily.

On the other hand, allopathic products have active components that aim at addressing the underlying causes of problems associated with eyes. Among the differences between herbal and allopathic under-eye creams is that allopathic products yield faster results than herbal ones. It should be noted that while there are rare cases of irritation caused by herbal products, some side effects of allopathic ones include skin dryness and flaking (20, 25).

### **XIV. HERB COMPONENTS AND THEIR MODE OF ACTION**

#### **Plant Description**

Various medicinal plants have been extensively utilized in the preparation of herbal under-eye creams because of their antioxidant, anti-inflammatory, and skin-soothing actions.

#### **i. Clitoria ternatea (butterfly pea)**

The components in *Clitoria ternatea* include essential bioactive agents, namely flavonoids, anthocyanins, and phenolics. These are known for their potent anti-inflammatory and antioxidant properties. In addition, the plant possesses antimicrobial, analgesic, and neuroprotective actions that contribute to better cellular health in the skin (26).



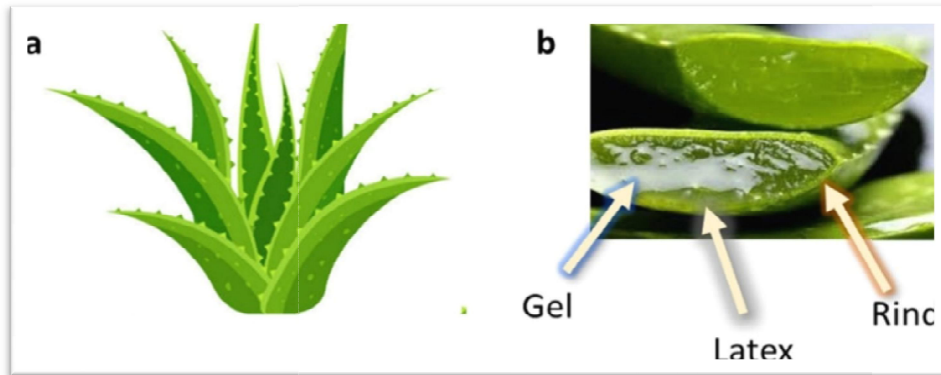
**Fig. 3 : Clitoria ternatea (26)**

#### **ii. Aloe vera**

The acemannan is found in the Aloe vera plant leaves. Aloin is another chemical found in the leaves that is regarded as a toxic component. The most common products made from Aloe



Vera are those that use the gel part of the leaf. This compound is extensively used in creams, cosmetic products, ointments, and gels to treat small burns, skin injuries, insect stings, and windburns (27).



**Fig. 4:** Aloe Vera Plant (a) and leaf (b) (28).

**iii. Amla (*Phyllanthus emblica*)**

Amla is rich in vitamin C, polyphenols, and flavonoids, which provide strong antioxidant and anti-inflammatory effects. It helps protect the skin from oxidative stress and contributes to improving overall skin tone and appearance (29).



**Fig. 5:** Amla (29)

**iv. Cucumber (*Cucumis sativus*)**

The cucumber is a highly hydrating vegetable that offers cooling and refreshing effects to the skin. The cucumber is also rich in anti-inflammatory, antioxidant, and hydrating properties that make it very useful in getting rid of eye puffiness and in generally improving the condition of the under-eye region (30).

**v. Potato Starch**

Potato starch can be applied to the under-eye region as an effective way of treating puffiness and discoloration of the eye area. The potato starch contains anti-inflammatory, lightening, and astringent properties that work effectively towards improving skin condition. The remedy involves grating a piece of raw potato and applying it to the eye with the help of cotton. Alternatively, slices of cold potato may be placed on top of the eyes for around 10-20 minutes (31).



#### **XV. EXCIPIENTS IN HERBAL UNDER-EYE CREAM FORMULATION**

The use of excipients in the formulation of herbal under-eye creams is significant for the stabilization, efficacy, and performance of the product. Some of the excipients commonly employed include natural oils, humectants, emulsifiers, and preservatives.

Almond oil works as an emollient, providing moisturization to the skin and eliminating dark circles and swelling around the eyes. Vitamin E, on the other hand, acts as an antioxidant, reducing the risk of oxidative stress and providing moisture to the skin. Rose water is another component used in natural formulations due to its hydrating and astringent nature.

The inclusion of glycerin in the formulation helps provide moisturization and softness to the skin. The use of stearic acid and cetyl alcohol as emulsifiers provides the desired texture of the cream. In addition, the presence of sodium hydroxide helps control the pH levels in the formula, while methyl paraben works as a preservative (32).

#### **XVI. PARAMETERS USED IN THE EVALUATION OF HERBAL EYE CREAM**

Evaluation of herbal eye cream is conducted based on different physicochemical and cosmetic factors to establish the effectiveness and applicability of the herbal eye cream. Important factors that are used to evaluate herbal eye cream include color, aroma, texture, pH, spreadability, viscosity, washability, homogeneity, and stability.

Factors such as color, aroma, and texture are used to evaluate the acceptability and quality of the herbal eye cream. The pH of the herbal eye cream is determined to establish whether the herbal eye cream formulation is safe and does not irritate the skin. Spreadability and viscosity factors are considered during the evaluation to determine the ease with which the cream can be applied.

#### **XVII. FUTURE PROSPECTS OF UNDER-EYE CREAMS FOR DARK CIRCLES**

The prospects for under-eye creams used to treat dark circles are bright since there is an increased understanding of skincare and an increase in cases of periorcular disorders like dark circles and puffy eyes. The rise in demand for natural or herbal products coupled with developments in cosmetics technology has played a crucial role in the creation of such products (35, 36).

The contemporary lifestyle that incorporates stress and insufficient sleep has increased the demand for under-eye creams. Herbal under-eye creams have gained prominence owing to their nourishing effects and suitability for the skin (36).

Over the coming years, the improvement in formulation methods alongside continuous research on phytochemicals will make under-eye creams even more effective and popular (35, 36).

#### **XVIII. CONCLUSION**

Herbal under-eye creams represent an effective method of treating dark circles due to their safe and natural components along with a relatively low level of potential side effects. Different reasons for the appearance of dark circles, including aging, lifestyle, and other factors, make them hard to treat.

Ingredients used in the manufacture of herbal under-eye creams, like Clitoria ternatea, aloe vera, amla, cucumber, and potato starch, bring many advantages to users because of their antihistamine, anti-inflammatory, hydrating, and soothing properties that help reduce puffiness and moisturize the under-eye area.

Unlike other methods, herbal under-eye cream represents a relatively safe approach that has good compliance and requires no additional medical interventions. Though the effects will not appear right away, they will prove effective enough in the long run.

Thus, herbal under-eye creams represent an excellent choice of treatment due to many advantages they possess.



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