



Exploring Herbal Eye Patches for Under Eye Care

Dr. A. Seetha Devi*, T. Aditya, B. Harshini, G. Poojasree, V. Sruthi
Gokaraju Rangaraju College of Pharmacy, Bachupally, Hyderabad, Telangana, India.
*Corresponding author's E-mail: seethagottipati@gmail.com

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ABSTRACT

Under-eye concerns are a common cosmetic problem experienced by people of different age groups. Issues such as dark circles, puffiness, fine lines, wrinkles, and dry skin around the eyes can develop due to various factors, including lack of sleep, stress, aging, dehydration, prolonged screen time, and environmental exposure. These conditions can affect facial appearance and may impact an individual's confidence and overall skin health. This review examines the major causes and underlying mechanisms responsible for under-eye concerns and discusses the available treatment options, with particular emphasis on natural and herbal remedies. Various herbal-based formulations, such as eye patches, gels, creams, masks, and serums, are reviewed for their potential benefits in under-eye care. Natural ingredients including aloe vera, potato extract, liquorice, cucumber, rose water, green tea, and glycerin have been widely recognized for their soothing, moisturizing, antioxidant, and skin-brightening properties. These ingredients may help reduce pigmentation, minimize puffiness, improve skin hydration, and support skin rejuvenation. The purpose of this review is to provide a comprehensive overview of the effectiveness of herbal approaches in managing under-eye concerns while highlighting their safety, affordability, compatibility with the skin, and environmentally friendly nature compared to conventional synthetic cosmetic products.

Keywords: Dark circles, puffiness, wrinkles, dryness, hydration, moisturizing, pigmentation, collagen, herbal, brightening, creams, gels, serums.

INTRODUCTION

The human eye is a highly specialized sensory organ that enables vision by detecting light and transmitting information to the brain. Much like a camera, it captures light and converts it into meaningful images, allowing us to perceive colour, shape, movement, and depth. Light enters through the transparent cornea, which directs and focuses it. The iris regulates the amount of light by adjusting the pupil size, while the lens changes shape to focus the image sharply onto the retina. The retina contains two types of photoreceptor cells: rods, which are responsible for vision in dim light, and cones, which enable colour perception and detailed sight. These cells convert incoming light into electrical impulses that travel through the optic nerve to the brain, where they are processed into the images we see. The eye is securely positioned within the bony orbit of the skull, and its components work in coordination to provide clear vision, object recognition, depth perception, and awareness of the surrounding environment. Function: The primary function of the eye is to sense light and transform it into visual information. This enables vision, recognition of objects, environmental awareness, and differentiation of colours.¹⁻³

1. PARTS OF EYE:

1.1 Conjunctiva

The conjunctiva is the membrane covering the sclera, the white portion of your eye. The conjunctiva also covers the interior of your eyelids. The conjunctiva helps lubricate the eyes by generating mucus and tears. It also aids in immunological monitoring and prevents microorganisms from entering the eye.⁴⁻⁵

1.2 Sclera

The whites of the eye sclera cover more than 80% of the eyeball's surface. The sclera has a smooth, white exterior but is brown on the inside. The episclera is a thin layer of tissue on top of the sclera that has tiny blood vessels that provide the sclera with nutrients. If the sclera or episclera becomes inflamed, it results in a condition known as scleritis or episcleritis, respectively.

1.3 Iris

The iris is the coloured part of the eye and is unique to each person. This structure is located in the front of the eye, between the cornea on the outside and the lens on the inside. The iris also performs what is known as the "accommodation reflex", which is the eye's instinctive ability to shift focus from nearby to distant objects. This action requires adjusting the pupil's aperture, the shape of the lens, and convergence.

1.4 Pupils

The pupil is seen as a black dot in the centre of the iris. It's essentially a hole that allows the eye to focus on the things in front of it. Similar to the iris, they open and close to regulate the amount of light that enters the eye. When light enters the eye through the lens, it focuses light rays through the pupils and into the retina. The difference between the centres of your pupils is called your pupillary distance.⁶

1.5 Cornea

The cornea is the clear and protective outer layer of your eye. Along with the sclera, the cornea is a barrier against dirt, infectious microorganisms, and other substances that can damage the eye.



1.6 Retina

The retina is a light-sensitive layer that covers your eye's rear surface. Images are transmitted to the retina when your eye picks up the images. It converts images into impulses that are sent to your brain through the optic nerve, allowing you to see and interpret images.

1.7 Eye Lens

The lens of the eye is the transparent lentil-shaped structure inside your eye. It's a natural lens located behind the iris and to the front of the vitreous humour which is a clear, colourless, gelatinous mass that fills the gap between the lens and the retina.

1.8 Optic Nerve

The optic nerve is a bundle of about 1.2 million nerve fibres that transmit visual information to the central nervous system (CNS). There is one nerve per eye connecting each eye to the brain.

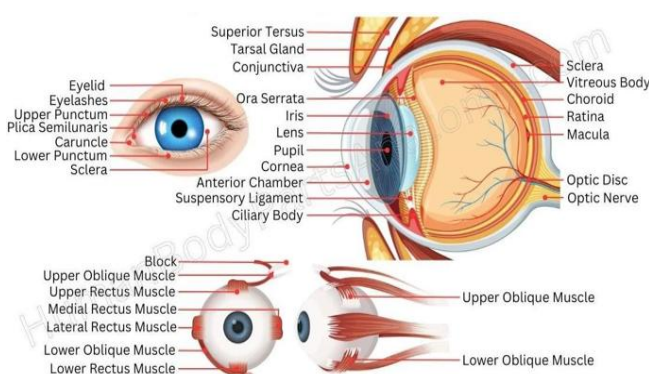


Figure 1: Parts of Eye

2. TYPES OF UNDER EYE DISORDERS:

There are various types of under eye problems, some are common and uncommon. These include:⁷⁻⁹

2.1 Dark Circles:

Dark circles are the darker patches that show up under your eyes, often appearing in shades of blue, purple, brown, or even black. While they're usually not a medical issue, they can make you look tired or older than you really are.

A mix of factors can contribute to dark circles. Lack of proper sleep, poor nutrition, genetics, and the natural ageing process all play a role. Lifestyle habits like smoking, heavy drinking, and irregular sleep patterns can make the blood vessels under your eyes more noticeable, deepening the shadows.

Certain health conditions—such as dermatitis, thyroid problems, or iron deficiency—can also cause dark circles. On top of that, too much sun exposure can trigger excess melanin production, leading to pigmentation that darkens the skin beneath your eyes.

2.2 Puffiness and under eye bags:

Eye bags or puffiness under the eyes are usually not serious, but they do become more common as we get older. You

might notice mild swelling or sagging in the lower eyelids. This happens because the muscles and tissues that support the eyelids gradually weaken. As a result, the delicate skin starts to loosen, and the fat that normally cushions the eyes can shift downward. Fluid may also collect in this area, making the puffiness more noticeable. In some cases, certain medical conditions can contribute to this issue. The good news is that under-eye bags are rarely

a sign of anything severe. With consistent skincare and a few healthy lifestyle adjustments, you can often reduce their appearance and keep your eyes looking fresher.

2.3 Fine lines and wrinkles:

Wrinkles under the eyes are a normal part of getting older. As the years go by, the skin naturally changes, and fine lines begin to appear. The area beneath the eyes is especially prone to these changes because the skin there is thinner and less elastic, making it more sensitive to the effects of ageing. Factors like repeated sun exposure, smoking, frequent facial expressions, and even genetics can speed up the process, causing wrinkles to show up earlier or more prominently.

2.4 Dry under eyes:

Dryness around the eyes can be uncomfortable and even painful. It often happens because of allergies, chronic skin conditions, or simply as part of the ageing process. Since the skin under the eyes is very delicate, it needs extra care and hydration to prevent dry, itchy patches. Ingredients like ceramides, vitamin E, and hyaluronic acid are especially helpful in restoring moisture and keeping the area soft and healthy. Several factors can raise the risk of dry eyes. Ageing, hormonal changes such as those after menopause, eyelid problems, and smoking are common contributors. Environmental triggers also play a big role wearing contact lenses, living in low-humidity conditions, or being exposed to air conditioning, sunlight, dust, and wind can all make dryness worse. Even everyday activities like long hours on the computer, extended reading, or driving can strain the eyes and intensify symptoms.

2.5 Under eye hollows:

When the area under your eyes looks sunken, it's often referred to as under-eye hollows. This delicate region can appear dark, recessed, and hollow, and sometimes it shows up alongside dark circles. There are several reasons why under-eye hollows develop. Genetics and the natural ageing process are common factors, but they can also be triggered by sudden weight loss, dehydration, lack of sleep, or nutritional deficiencies. Certain medications and even trauma to the eye area may contribute as well.

DARK CIRCLES:

Dark circles refer to the darker coloured skin that appears beneath your eyes, often giving a tired or aged look. They can range in shade from blue or purple to brown or black, depending on skin tone and underlying causes.

These shadows form when the blood vessels under the thin

skin of the eyes become more visible or when pigmentation increases in that area. While not usually a medical concern, dark circles are a common cosmetic issue influenced by factors like fatigue, genetics, ageing, and lifestyle habits.¹⁰⁻¹³



Figure 2: Under Eye Disorders

3. TYPES OF DARK CIRCLES:

3.1 Pigmented Dark Circles:

These usually look brown or black under the eyes. They happen when the skin produces too much melanin, the

pigment that gives skin its colour. Pigmented dark circles can be something born with or develop over time, and they make the under-eye area appear noticeably darker.

3.2 Vascular Dark Circles:

These show up as bluish, pink, or purplish tones beneath the eyes. They are caused by poor blood flow and thinning skin, which makes tiny blood vessels more visible. People with fair or delicate skin often notice this type more because the vessels stand out more easily.

3.3 Structural Dark Circles:

These are the “sunken eyes” look, where a groove runs from the inner corner of the eye down toward the cheek. They can appear in different shades and are often linked to a loss of volume under the eyes. As we age and the fat in our cheeks decreases, the area beneath the eyes looks hollow, creating shadows that make circles more obvious.¹⁴

3.4 Allergic Dark Circles:

Result from nasal congestion or allergies that cause blood pooling under the eyes, giving a bluish tint.

3.5 Post inflammatory dark circles:

Develops after skin irritation or inflammation, such as eczema or dermatitis, leading to lingering pigmentation.¹⁵



Figure 3: Types of dark circles

4. CAUSES OF DARK CIRCLES:¹⁶

4.1 Genetics:

Inherited traits like thin skin or higher pigmentation around the eyes can make dark circles more noticeable. If your parents have them, you’re more likely to develop them too. Genetic factors can also affect how blood vessels show through the skin and how melanin is distributed.

4.2 Aging:

As we age, collagen production slows down, and the skin becomes thinner and less elastic. This makes underlying blood vessels more visible, creating a darker appearance under the eyes. Fat loss and sagging skin also contribute to shadow formation.

4.3 Lack of Sleep:

Poor sleep dulls the skin and reduces circulation, making dark areas stand out more. Fatigue can cause blood to pool

under the eyes, giving them a bluish or purplish tint. Consistent rest helps maintain healthy skin tone and brightness.

4.4 Dehydration:

When the body lacks enough water, the skin loses its plumpness and elasticity. The area under the eyes can look sunken, shadowed, and tired. Staying hydrated helps maintain smooth, supple skin and reduces the hollow appearance.

4.5 Allergies:

Allergic reactions cause inflammation and swelling, which can darken the skin under the eyes. Constant rubbing or scratching worsens the problem by irritating the delicate skin and breaking tiny blood vessels.

4.6 Sun Exposure:

Excessive sunlight increases melanin production, leading to

pigmentation and darkening of the skin. Over time, UV damage can thin the skin and make blood vessels more visible, intensifying dark circles.

4.7 Lifestyle:

Habits like smoking, drinking alcohol, and poor diet reduce oxygen flow and damage skin cells. These behaviours can lead to dull, uneven skin tone and worsen the appearance of dark circles.

4.8 Fluid Retention:

High salt intake or hormonal changes can cause puffiness and swelling under the eyes. This creates shadows and makes the area look darker. Reducing sodium and improving circulation can help minimize this effect.

4.9 Medical Conditions:

Certain health issues, such as anaemia or thyroid disorders, can cause poor oxygenation or hormonal imbalances, leading to paler skin and more visible blood vessels under the eyes.

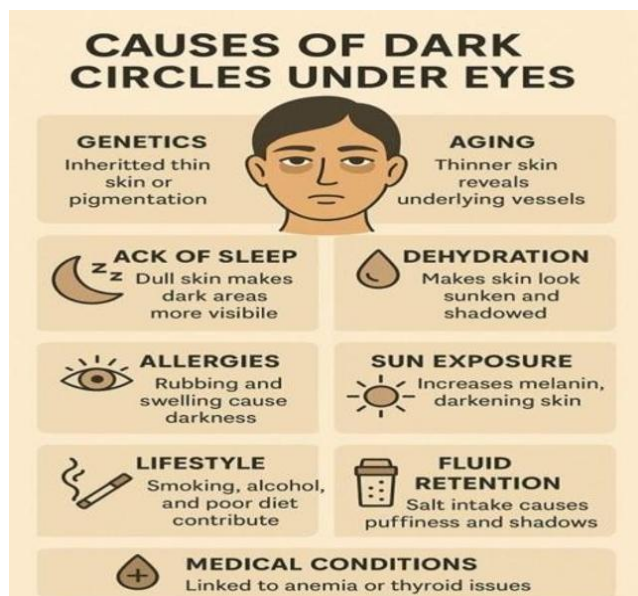


Figure 4: Causes of dark circles

5. PATHOPHYSIOLOGY OF DARK CIRCLES:

5.1 Increased Melanin Production (Pigmented Type)

Melanin is the pigment responsible for skin colour. In some individuals, excessive melanin accumulates around the eye. Genetic predisposition, sun exposure, allergies, and chronic rubbing of the eyes stimulate melanocytes. Melanocytes increase melanin synthesis. Melanin deposits in the epidermis and dermis. The skin around the eyes appears brown or black. This is caused due to hereditary factors, sunlight exposure, allergic conditions and repeated rubbing of eyes.¹⁷⁻¹⁹

5.2 Vascular Congestion (Vascular Type)

The skin under the eyes is extremely thin and contains many blood vessels. Poor sleep, fatigue, stress, and nasal congestion can slow blood circulation. Blood accumulates in

the small veins beneath the eyes. Deoxygenated blood appears bluish or purplish through the thin skin. Blood vessel dilation makes the darkness more visible. This is caused due to sleeplessness, stress, sinus congestion, smoking.

5.3 Structural Shadowing (Anatomical Type):

Dark circles may occur even without pigmentation or vascular problems. Aging causes loss of collagen, elastin, and facial fat. Tear trough deformities develop below the eyes. Light falling on the hollow area creates shadows. These shadows give the appearance of dark circles. This is caused due to aging, weight loss, genetics.

5.4 Skin Thinning Due to Aging:

With age, collagen production decreases. The skin becomes thinner and more transparent. Underlying muscles and blood vessels become visible, then area appears darker.

5.5 Fluid Retention and Edema:

Excess salt intake, lack of sleep, hormonal changes, and allergies can cause fluid accumulation. Puffiness develops around the eyes. Swelling casts shadows and makes blood vessels more noticeable.

5.6 Nutritional Deficiencies:

Iron Deficiency (Anaemia); Reduced haemoglobin decreases oxygen delivery to tissues, Skin becomes pale. Underlying veins become more prominent through pale skin. Also, vitamin deficiencies of B12, K, C and E.

6. TREATMENT FOR DARK CIRCLES:

6.1 UNDER EYE PATCHES:

Under-eye patches are small gel, hydrogel, or fabric masks placed beneath the eyes. They are designed to hydrate the delicate under-eye skin and temporarily improve the appearance of dark circles, puffiness, and fine lines.^{20,21}

Advantages:

- Reduces puffiness.
- Provides hydration.
- Refreshes tired eyes.
- Easy to use.

Disadvantages:

- Temporary results.
- Possible skin irritation.
- Can be expensive.
- Not suitable for everyone.

6.2 HOME CARE:

Home care for dark circles involves simple, safe, and cost-effective measures carried out at home to reduce under-eye pigmentation and puffiness. These methods include proper sleep, hydration, healthy nutrition, cold compresses, use of

sunscreens and natural remedies to maintain healthy skin around the eyes.

Advantages:

- Simple and inexpensive.
- Uses available ingredients.
- Safe when done correctly.

Disadvantages:

- Results are slow.
- May not completely remove dark circles.
- May cause irritation.

6.3 MEDICAL TREATMENT:

Medical treatment for dark circles is recommended when home remedies and lifestyle changes do not provide sufficient improvement. The choice of treatment depends on the underlying cause, such as excess pigmentation, visible blood vessels, skin thinning, or under-eye hollowness. Medical treatments are performed by dermatologists or cosmetic specialists and may include retinoid creams, topical medications, chemical peels, laser therapy, fillers, and other advanced procedures. These treatments aim to reduce pigmentation, improve skin quality, stimulate collagen production, and restore a youthful appearance to the under-eye area.

Advantages:

- More effective results.
- Targets the underlying cause.
- Long lasting effects.
- Improves skin quality.

Disadvantages:

- Expensive.
- Possible side effects.
- Risk of complications.

UNDER EYE SERUM:

An under-eye serum is a lightweight skincare product specially formulated for the delicate skin around the eyes. It contains concentrated active ingredients such as caffeine, hyaluronic acid, peptides, vitamin C, retinol, and antioxidants that help address common under-eye concerns, including dark circles, puffiness, fine lines, wrinkles, dryness, and under-eye bags. Due to its light texture and small molecular size, an under-eye serum is easily absorbed into the skin, providing targeted treatment and nourishment. Regular use of an under-eye serum can help improve skin hydration, firmness, and overall appearance, making the eyes look brighter and more refreshed.

Advantages:

- Lightweight and quickly absorbed.
- Provides deep hydration.
- Helps reduce puffiness and dark circles.
- Improves skin elasticity and firmness.
- May reduce the appearance of fine lines and wrinkles.

Disadvantages:

- Results may take several weeks to appear.
- Some active ingredients can cause irritation in sensitive skin.
- Requires regular and consistent use.
- More expensive than basic moisturizers.

RETINOL EYE CREAM:

Retinol eye cream is a specialized skincare product formulated for the delicate skin around the eyes. It contains retinol, a derivative of vitamin A, which is widely used in dermatology for its anti-aging benefits. Retinol works by increasing skin cell turnover and stimulating collagen production, helping to improve the appearance of fine lines, wrinkles, uneven skin texture, and mild dark circles. Regular use of retinol eye cream can make the under-eye area appear smoother, firmer, and more youthful. Since the skin around the eyes is sensitive, retinol eye creams are usually formulated with lower concentrations of retinol and moisturizing ingredients to minimize irritation.

Advantages:

- Stimulates collagen production.
- Reduces fine lines and wrinkles.
- Improves skin texture and firmness.
- Helps brighten the under-eye area.
- Supports skin renewal and rejuvenation.

Disadvantages:

- May cause dryness, redness, or irritation.
- Results take several weeks to become noticeable.
- Can increase sensitivity to sunlight.
- Not suitable for very sensitive skin without medical advice.
- Requires regular use for best results.

SKIN MOISTURE EYE CREAM:

Skin moisture creams for dark circles are specially formulated to hydrate and nourish the delicate under-eye area while targeting pigmentation and puffiness. By



combining emollients, humectants, and natural botanicals such as aloe vera, cucumber, liquorice, or green tea, these creams restore moisture balance, improve skin elasticity, and reduce the appearance of fine lines. Their antioxidant and brightening properties help fade dark circles gradually, while the soothing action calms-tired skin. Regular use not only enhances under-eye radiance but also supports overall skin health, making them a gentle, affordable, and sustainable alternative to harsher treatments.

Advantages:

- May cause dryness, redness, or irritation.
- Results take several weeks to become noticeable.
- Can increase sensitivity to sunlight.
- Not suitable for very sensitive skin without medical advice.
- Requires regular use for best results.

Disadvantages:

- Results are temporary and require regular use.
- Does not treat severe dark circles or deep wrinkles.
- Some formulations may feel greasy on oily skin.
- May cause irritation in sensitive individuals if certain ingredients are present.

MULTIPEPTIDE EYE GEL:

A multi-peptide gel is an advanced skincare product formulated with multiple peptides that help improve the appearance of the delicate skin around the eyes. Peptides are short chains of amino acids that act as building blocks for proteins such as collagen and elastin, which are essential for maintaining skin firmness and elasticity. Multi-peptide eye creams are commonly used to reduce the appearance of fine lines, wrinkles, puffiness, dark circles, and under eye hollows. Regular use can help strengthen the skin barrier, improve skin texture, and promote a smoother, firmer, and more youthful-looking under-eye area.

Advantages:

- Helps stimulate collagen and elastin production.
- Improves skin firmness and elasticity.
- Reduces the appearance of fine lines and wrinkles.
- Helps decrease puffiness and signs of fatigue.
- Provides hydration and improves skin texture.
- Generally gentle and suitable for most skin types.

Disadvantages:

- Results may take several weeks or months to

become noticeable.

- Usually more expensive than basic moisturizers.
- Cannot completely correct deep under-eye hollows.
- Requires consistent use for best results.

EYE SERUM:

An eye serum is a lightweight, fast-absorbing skincare formulation specifically designed for the delicate skin around the eyes. It contains concentrated active ingredients such as peptides, caffeine, hyaluronic acid, vitamin C, retinol, and antioxidants that help address common under-eye concerns, including dark circles, puffiness, fine lines, wrinkles, dryness, and signs of fatigue. Due to its lightweight texture and high concentration of active ingredients, an eye serum penetrates the skin more effectively than many traditional creams. Regular use of an eye serum can help improve hydration, brighten the under-eye area, and promote a smoother, firmer, and more youthful appearance.

Advantages:

- Lightweight and non-greasy.
- Absorbs quickly into the skin.
- Contains concentrated active ingredients.
- Helps reduce puffiness and dark circles.
- Improves skin hydration and texture

Disadvantages:

- May be more expensive than regular eye creams.
- Requires consistent use for visible results.
- Some active ingredients may cause irritation in sensitive skin.

EYE OINTMENTS:

Eye ointments are semi-solid, oil-based formulations specially designed for application in or around the eyes. They contain active ingredients dispersed in a greasy base, such as petrolatum or mineral oil, which helps protect and lubricate the delicate eye area. Eye ointments are commonly used to treat dry eyes, irritation, inflammation, infections, and severe dryness of the skin around the eyes. Due to their thick consistency, they remain on the surface for a longer period, providing prolonged moisture and protection. Eye ointments are often applied at bedtime because they may temporarily blur vision.

Advantages:

- Provides long-lasting lubrication and moisture.
- Forms a protective barrier against dryness and irritation.



- Remains in contact with the eye area for an extended period.
- Useful for treating severe dryness and eye discomfort.
- Reduces moisture loss from the skin.

Disadvantages:

- Greasy and thick texture.
- May cause temporary blurred vision.
- Can feel uncomfortable during daytime use.
- May attract dust or debris if applied excessively.
- Less cosmetically appealing than creams or serums.

EYE ROLL ONS:

Eye roll-ons are specialized skincare products designed for the delicate under-eye area. They consist of a liquid serum or gel contained in a tube with a rolling applicator, usually made of metal or a cooling material. The rolling action provides a gentle massage effect that helps improve circulation, reduce puffiness, and refresh tired eyes. Eye roll-ons often contain active ingredients such as caffeine, hyaluronic acid, peptides, vitamins, and antioxidants that help address concerns like dark circles, under-eye bags, dryness, and fatigue.

Advantages:

- Easy and convenient to apply.
- Provides a cooling and refreshing effect.
- Helps reduce puffiness and under-eye bags.
- Improves blood circulation through gentle massage.
- Lightweight and non-greasy formulation.

Disadvantages:

- Results are usually temporary.
- May not be effective for severe dark circles or deep wrinkles.
- Requires regular and consistent use.
- Some products may contain ingredients that irritate sensitive skin.
- Generally, less moisturizing than eye creams.

EYE BALMS:

Eye balms are semi-solid skincare formulations specially designed for the delicate skin around the eyes. They are typically made with nourishing oils, waxes, butters, and moisturizing ingredients that help protect the skin, lock in

moisture, and improve skin softness. Eye balms create a protective barrier on the skin surface, making them particularly beneficial for dry, dehydrated, or mature skin. They are commonly used to reduce dryness, improve skin texture, and minimize the appearance of fine lines around the eyes.

Advantages:

- Provides intense and long-lasting hydration.
- Forms a protective barrier that prevents moisture loss.
- Helps soften and smooth the under-eye skin.
- Reduces dryness and flakiness.
- Suitable for dry and mature skin types.

Disadvantages:

- Can feel heavy or greasy on the skin.
- May not be suitable for oily skin types.
- Absorbs more slowly than serums or gels.
- May cause milia (tiny white bumps) in some individuals if overused.
- Does not effectively treat severe dark circles or deep under-eye hollows.

UNDER EYE MASKS:

Under-eye masks are skincare products specifically designed for the delicate skin beneath the eyes. They are usually made of hydrogel, bio-cellulose, fabric, or collagen-infused materials and are enriched with active ingredients such as hyaluronic acid, caffeine, peptides, vitamin C, and antioxidants. Under-eye masks help provide intense hydration, reduce puffiness, soothe tired eyes, and temporarily improve the appearance of dark circles and fine lines. They are commonly used as a quick treatment to refresh and rejuvenate the under-eye area.

Advantages:

- Provides instant hydration to the under-eye skin.
- Helps reduce puffiness and under-eye bags.
- Gives a cooling and soothing effect.
- Temporarily improves the appearance of fine lines and dark circles.
- Easy and convenient to use.
- Makes the eyes look refreshed and revitalized.

Disadvantages:

- Results are usually temporary.
- Does not treat the underlying cause of dark circles or



wrinkles.

- Regular use can be expensive.
- Some ingredients may cause irritation in sensitive skin.

HERBAL EYE PATCHES:

Herbal eye patches are natural skincare products designed to treat the delicate under-eye area. They're typically made with plant-based ingredients like aloe vera, cucumber, green tea, liquorice, rose water, or centella asiatica. These botanicals provide soothing, hydrating, antioxidant, and brightening effects, which can help reduce puffiness, dark

circles, fine lines, and dryness.

Herbal eye patches are preferred over synthetic ones because they are gentler on sensitive skin, safer with fewer risks of irritation, and enriched with natural botanicals like aloe vera, cucumber, green tea, and liquorice that provide hydration, soothing, antioxidant, and brightening effects; they are also more affordable, eco-friendly, and sustainable, offering gradual but holistic improvement in under-eye health compared to synthetic treatments that may deliver faster results but often involve harsher chemicals, higher costs, and less environmentally conscious practices.

Table 1: Herbs used in the formulation of eye patches with benefits and extraction processes

Herb	Benefits	Extraction process	General concentrations
Aloe vera	Hydration, soothing	Gel extraction	5-20%
Cucumber	Cooling, puffiness reduction	Aqueous titration	2-10%
Green tea	Antioxidant	Infusion/ hydroalcoholic extraction	0.5-5%
Coffee	Reduce puffiness	Solvent extraction	0.5-3%
Turmeric	pigmentation	Soxhlet extraction	0.1-2%
Liquorice	Skin lightening	Maceration/ Soxhlet	0.5-3%
Rose water	Soothing	Distillation/ infusion	5-30%
Almond oil	Moisturizing	Cold press	1-10%
saffron	Brightening	Maceration in water or ethanol	0.1-1%
Potato	Dark circle	Aqueous extraction	2-10%
Chamomile	Anti-inflammatory	Infusion/ maceration	0.5-5%
Centella asiatica	Collagen support	Hydroalcoholic extraction	0.5-5%
Amla	Anti-oxidant	Decoction/ hydroalcoholic extraction	1-5%
Sandalwood	Brightening	Steam distillation	0.1-2%
Ginseng	Improves circulation	Hydroalcoholic extraction	0.5-3%
Papaya leaf	Remove dead cells	Juice extraction or aqueous extraction	1-5%
Grape seed	Protects collagen	Cold press or solvent extraction	0.5-5%
Pomegranate	Protect premature aging	Solvent extraction (ethanol/water)	0.5-5%
Fenugreek	Nourish and moisture	Maceration in water or ethanol	1-5%
Lotus	Skin hydration	Aqueous extraction	0.5-3%
Hibiscus	Elasticity	Hydroalcoholic extraction	1-5%
Bearberry	Skin pigmentation	Ethanol extraction	0.5-2%
Mulberry	Reduce melanin production	Hydroalcoholic extraction	0.5-3%

Table 2: Chemical agents commonly used in the formulation of eye patches along with benefits

Chemical agents	Uses	General concentrations
Hyaluronic acid	Puffiness, under eye bags	0.1-2%
Retinol	Wrinkles, collagen production	0.01-0.3%
Ascorbic acid	Skin brightening, pigmentation	5-10%
Niacinamide	Pigmentation, inflammation	2-5%
Kojic acid	Reduce melanin production	1-2%
Azelaic acid	Inflammation, uneven skin tone	5-10%
Alpha arbutin	Pigmentation	1-2%
Ceramides	Prevent moisture loss	0.5-3%
Glycerine	Hydration	2-10%
Allantoin	Promotes skin healing	0.1-2%
Coenzyme Q10	Anti-oxidant	0.1-1%



7. Procedure for the formulation of eye patches:

The preparation of ocular patches involves the selection of appropriate active ingredients and excipients. A polymeric base is prepared by dissolving a suitable gelling polymer in warm distilled water with continuous stirring until a clear and homogeneous solution is obtained. Plasticizers are then incorporated into the polymer solution to improve the flexibility and mechanical properties of the patch matrix. Subsequently, herbal extracts or powdered active ingredients are dispersed uniformly within the formulation and mixed until a smooth, gel-like consistency is achieved.

The prepared formulation is cast onto a suitable mould and spread evenly to obtain ocular patches of uniform thickness. The patches are then subjected to controlled drying, either at room temperature or in a hot-air oven maintained at 35–40°C, to facilitate the formation of flexible and stable patches. After drying, the patches are carefully removed from the mould and cut into the desired shape and dimensions suitable for application to the periocular region. The final ocular patches are stored in airtight containers to protect them from moisture uptake, contamination, and other environmental factors that may affect their stability and performance.

8. EVALUATION TESTS FOR EYE PATCHES:

8.1 Phytochemical screening:

Phytochemical screening involves a series of simple lab tests to identify major classes of plant secondary metabolites such as alkaloids, flavonoids, tannins, saponins, terpenoids, and phenolics. These tests are preliminary but essential for confirming the presence of bioactive compounds in medicinal plants. Screening validates medicinal value and guides selection of plant materials.

8.2 Physical appearance:

To assess any product, begin by selecting a fair sample and examining its overall appearance under suitable lighting to check for colour, clarity, and uniformity. Pay attention to the surface and texture, ensuring it looks consistent and free from irregularities. A gentle smell can help confirm that the scent is appropriate and that no unpleasant odour is present. Testing the consistency by spreading or handling a small portion allows you to gauge its smoothness and uniform blend. Finally, capture all observations in a simple record, noting each parameter alongside what you observed for easy reference.

8.3 pH determination:

To determine the pH of a formulation, a small, accurately weighed sample is dispersed or dissolved in a measured volume of distilled water (or a suitable solvent if water-insoluble). A digital pH meter is calibrated beforehand using standard buffer solutions, then the electrode is immersed into the prepared sample solution. Once the reading stabilizes, the pH value is recorded. After measurement, the electrode is rinsed with distilled water to avoid contamination and stored properly in buffer solution for

future use.

8.4 Swelling index:

The swelling index of a formulation is determined by weighing a dry sample and then immersing it in a known volume of distilled water or buffer solution at room temperature. At fixed time intervals, the sample is removed, blotted gently to remove excess surface liquid, and weighed again. The increase in weight indicates the amount of liquid absorbed. The swelling index is calculated using the formula:

$$\text{Swelling Index (\%)} = \frac{W_t - W_0}{W_0} \times 100$$

where W_t is the weight after swelling and W_0 is the initial dry weight. This test helps evaluate hydration capacity, stability, and performance of gels, patches, and hydrogel-based formulations.

8.5 Thickness:

The thickness of a formulation is measured by placing the sample between the jaws of a calibrated digital vernier calliper or micrometre screw gauge. Multiple readings are taken at different points on the sample to account for uniformity, and the average value is calculated. This ensures consistency in dosage, mechanical strength, and overall product quality.

8.6 Spreadability:

To evaluate spreadability, a small amount of the formulation is placed between two clean glass slides. A known weight is then applied on the upper slide, allowing the formulation to spread. The distance or area covered in a given time is measured. Spreadability is calculated using the formula:

$$S = \frac{m \cdot L}{t}$$

Where, m is the applied weight, L is the length spread, and t is the time taken. This test helps determine how easily the product can be applied to the skin or surface, ensuring user comfort and uniform dosing.

8.7 Homogeneity:

To check homogeneity, a small portion of the formulation is spread thinly on a clean glass slide or plate and examined visually under good light. The sample is observed for uniform distribution of colour, texture, and absence of lumps, particles, or phase separation. For gels and ointments, smoothness is confirmed by rubbing a small amount between fingers, while for patches or films, the surface is inspected for evenness without cracks or irregularities. A homogeneous product indicates proper mixing and consistent quality, ensuring reliable performance.

8.8 Viscosity:

To measure viscosity, a representative sample of the formulation is placed in the cup or chamber of a viscometer (commonly a Brookfield viscometer or cone-and-plate



reometer). The instrument spindle or cone is immersed into the sample, and rotational speed is applied. The resistance offered by the sample to the spindle's movement is recorded as viscosity in centipoise (cP). Measurements are usually taken at different shear rates to understand flow behaviour, and the average value is reported. This test helps assess consistency, ease of application, and stability of gels, ointments, and other semi-solid formulations.

8.9 Stability testing:

Stability testing is carried out by storing the formulation under different environmental conditions such as room temperature, refrigerated conditions, and accelerated conditions (e.g., 40 °C ± 2 °C with 75 % RH ± 5 %). Samples are withdrawn at predetermined intervals and evaluated for changes in physical appearance, pH, viscosity, spreadability, drug content, and microbial growth. Observations are compared with initial values to assess whether the product maintains its quality, safety, and efficacy over time. This test helps predict shelf life and ensures the formulation remains stable under normal storage and usage conditions.

8.10 Microbial assay:

Microbial assay is performed to determine the presence and activity of microorganisms in a formulation. A measured sample is aseptically inoculated onto suitable nutrient agar or broth medium and incubated under controlled conditions (usually 24–48 hours at 30–37 °C). After incubation, microbial growth is observed and quantified either by counting colonies (CFU method), measuring zones of inhibition (for antimicrobial activity), or comparing turbidity against standards. The results indicate whether the product meets acceptable microbial limits or demonstrates antimicrobial properties, ensuring safety and efficacy.

8.11 Moisture content:

Moisture content is measured by weighing a known quantity of the sample and then drying it either in a hot air oven at a specified temperature (usually 60-70 °C) until a constant weight is achieved, or by using an infrared moisture balance or Karl Fischer titration for more precise analysis. The difference between the initial and final weight is used to calculate the percentage of moisture present in the formulation. This test helps assess product stability, shelf life, and susceptibility to microbial growth.

8.12 Skin irritation test:

The skin irritation test is performed by applying a small, measured amount of the formulation to a defined area of the skin (commonly on animal models or synthetic skin substitutes in lab studies). The site is observed at regular intervals for signs of redness, swelling, itching, or other visible reactions compared to a control area. The severity of irritation is scored using a standard scale, and results are recorded to assess the product's safety for topical use. This test helps ensure that the formulation is non-irritant and suitable for application on human skin.

8.13 Weight variation test:

The weight variation test is performed by randomly selecting a fixed number of individual units from a batch and weighing each one using a calibrated analytical balance. The average weight is calculated, and the individual weights are compared against this mean. The percentage deviation of each unit from the average is determined, and results are checked against pharmacopeial limits to ensure uniformity. This test confirms consistency in manufacturing and ensures each unit delivers the intended dose.

CONCLUSION

Herbal eye patches offer a gentle, eco-friendly, and affordable way to care for the under-eye area. Made with natural ingredients like aloe vera, cucumber, green tea, liquorice, and rose water, they soothe, hydrate, and brighten while reducing puffiness, dark circles, and fine lines. Though results take time and consistency, they're safer for sensitive skin and more sustainable than synthetic options. Combined with healthy habits like sleep, hydration, and sun protection, they enhance skin health. With more research, these remedies could become a trusted blend of traditional wisdom and modern dermatology.

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