



## A REVIEW ON PLANT PRODUCTS AS MULTIPLE EFFECT ON OPHTHALMIC DERMATOLOGY

Neha Patel<sup>1\*</sup>, Ms. Foram Mehta<sup>2</sup>, Dr. Pragnesh Patani<sup>3</sup>

<sup>1\*</sup> Student, Khyati College of Pharmacy, Palodia, Ahmedabad

<sup>2</sup> Assistant Professor, Khyati College of Pharmacy, Palodia, Ahmedabad

<sup>3</sup> Principal, Khyati College of Pharmacy, Palodia, Ahmedabad

**\*Corresponding Author:** Neha Patel

<sup>1\*</sup> Student, Khyati College of Pharmacy, Palodia, Ahmedabad, Email: [pneha8720@gmail.com](mailto:pneha8720@gmail.com)

---

### Abstract

Ophthalmic dermatology encompasses a diverse array of conditions affecting the delicate and sensitive skin around the eyes. The conventional management of such conditions often involves pharmaceutical interventions that may be associated with adverse effects. As an alternative approach, herbal remedies have gained attention for their potential multifaceted benefits in addressing various ophthalmic dermatological concerns. This review aims to consolidate current knowledge on the multiple effects of plant products used in the context of ophthalmic dermatology.

Through a comprehensive literature search, this review identifies and analyzes plants interventions that have shown promise in the management of conditions such as periorbital hyperpigmentation, eyelid eczema, dry skin around the eyes, and under-eye bags. The multifaceted effects of these plants include antioxidant, anti-inflammatory, anti-aging, moisturizing, and skin-lightening properties. Various bioactive compounds present in these plants, such as polyphenols, flavonoids, and essential oils, contribute to their therapeutic effects.

Furthermore, the review examines the safety and efficacy profiles of these plants interventions, taking into consideration potential adverse reactions and interactions. The integration of traditional wisdom, empirical evidence, and modern scientific studies provides a holistic perspective on the utilization of plants in ophthalmic dermatology.

In conclusion, herbal interventions offer a promising avenue for individuals seeking a more natural and holistic approach to managing ophthalmic dermatological conditions. However, further research is warranted to elucidate the mechanisms of action, optimize formulation techniques, and validate the clinical efficacy of these plants. A collaborative effort between traditional herbal medicine practitioners and modern dermatologists could potentially lead to the development of evidence-based plants interventions that complement conventional therapeutic strategies for ophthalmic dermatology.

**Keywords:** herbal remedies, ophthalmic dermatology, periorbital hyperpigmentation, eyelid eczema, natural interventions

### INTRODUCTION:

On both skin and systemic health, their application in ophthalmic dermatology holds promise not only as standalone treatments but also as adjunctive therapies to conventional approaches.

This review aims to provide a comprehensive overview of the role of plants in ophthalmic dermatology, focusing on their multiple effects on skin health around the eyes. By examining the

existing literature and scientific studies, we will explore the mechanisms of action through which various plants exert their therapeutic effects, including anti-inflammatory, antioxidant, antimicrobial, and wound-healing properties. Additionally, we will discuss the challenges and considerations in integrating plant's remedies into mainstream ophthalmic dermatology practice, such as standardization of formulations, dosage, and potential interactions with existing treatments.

Understanding the potential of plants to address the multifaceted aspects of ophthalmic dermatological concerns could offer new avenues for holistic patient care. This review seeks to contribute to the existing body of knowledge by providing insights into the rich world of herbal interventions and their promise in optimizing skin health and overall well-being in the context of ophthalmic dermatology.

The journey to harnessing the potential of these plants necessitates a comprehensive understanding of their safety profiles, potential allergenic properties, and any potential interactions. The harmonious amalgamation of traditional knowledge and modern scientific insights holds the key to developing evidence-based formulations and comprehensive treatment protocols.

In summary, the versatile attributes of plants products such as cucumber, potato, passionflower, European blueberry, green tea, saffron, wild asparagus, and papaya position them as promising candidates for integrative approaches in managing ophthalmic dermatological concerns. Further exploration through rigorous research, clinical trials, and collaboration between traditional herbal wisdom and contemporary dermatological expertise can unlock their full potential in cultivating holistic solutions for a range of periorbital skin issues.

## **DARK CIRCLES**

Dark circles, also known as periorbital dark circles or under-eye circles, refer to the darkened discoloration of the skin under the eyes. They can give the appearance of tiredness, aging, or a lack of sleep. Dark circles are a common concern and can affect people of all ages and skin types. There are various factors that contribute to the development of dark circles, and understanding these factors can help in managing and preventing them.

### **Causes:**

#### **1. Genetics:**

Genetic predisposition plays a significant role in the development of dark circles. If your family members have dark circles, you are more likely to develop them as well.

#### **2. Thin Skin:**

The skin under the eyes is thinner and more delicate compared to the rest of the face. Blood vessels beneath the skin become more visible due to this thinness, leading to a bluish or purplish tint.

#### **3. Blood Vessel Congestion:**

The skin around the eyes has a network of blood vessels. Factors like poor circulation, allergies, and certain lifestyle habits can lead to blood vessel congestion, making the under-eye area appear darker.

#### **4. Pigmentation:**

Excessive melanin production can lead to hyperpigmentation, causing the skin under the eyes to darken.

#### **5. Aging:**

As we age, the skin's collagen and elastin levels decrease, leading to thinner and looser skin. This can make blood vessels and underlying structures more visible, contributing to the appearance of dark circles.

#### **6. Lifestyle Factors:**

Lack of sleep, excessive stress, smoking, and a poor diet can contribute to the development of dark circles.

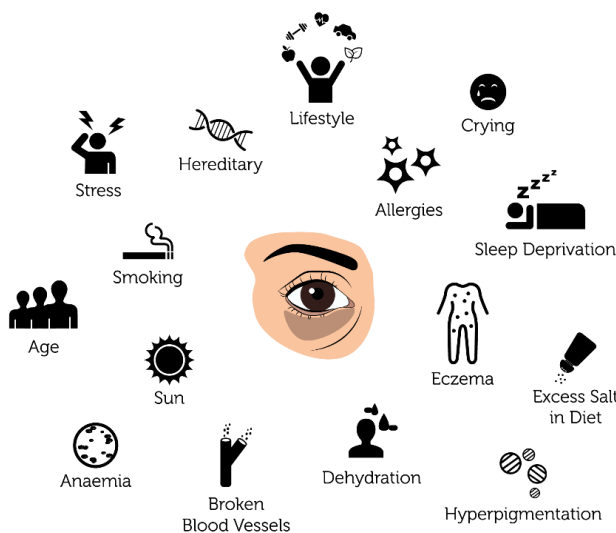
### 7. Allergies:

Allergic reactions can cause inflammation and swelling, which in turn can lead to the appearance of dark circles.

### 8. Sun Exposure:

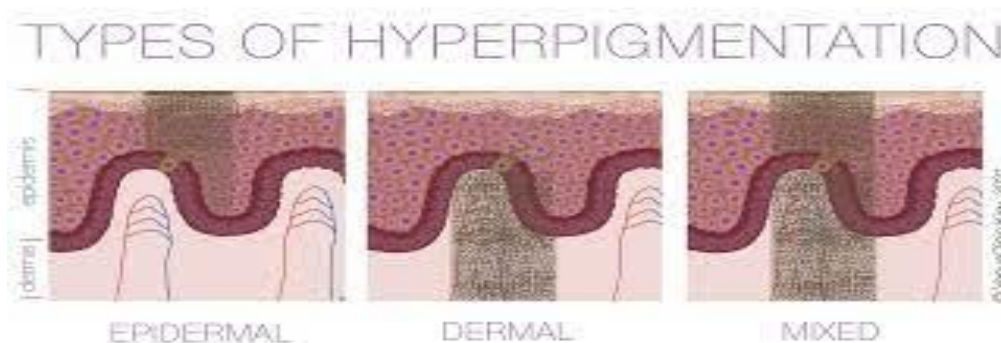
Prolonged sun exposure can stimulate melanin production, leading to increased pigmentation under the eyes.

## Causes of Dark Circles



### Prevention and Management:

1. **Adequate Sleep:** Getting enough sleep is crucial to prevent dark circles. Aim for 7-9 hours of quality sleep each night.
2. **Hydration:** Drink plenty of water to keep your skin and body hydrated, which can improve the appearance of the under-eye area.
3. **Healthy Diet:** Consume a balanced diet rich in antioxidants, vitamins, and minerals. Foods like fruits, vegetables, and nuts can promote skin health.
4. **Sun Protection:** Use sunscreen and wear sunglasses to protect the under-eye area from harmful UV rays.
5. **Topical Treatments:** Use eye creams containing ingredients like vitamin C, retinol, hyaluronic acid, and peptides. These can help improve collagen production, reduce pigmentation, and hydrate the skin.
6. **Cold Compresses:** Applying a cold compress can help constrict blood vessels and reduce puffiness, temporarily minimizing the appearance of dark circles.
7. **Allergy Management:** If allergies are contributing to your dark circles, manage them with appropriate medications or lifestyle changes.
8. **Cosmetic Treatments:** In more severe cases, cosmetic treatments like chemical peels, laser therapy, or dermal fillers can be considered under the guidance of a dermatologist or healthcare professional.



## SOME PLANTS TO TREAT PIGMENTATION

### POTATO

Potatoes have been used for centuries in various skincare treatments due to their natural properties that can benefit pigmentation and dry skin issues. They are rich in vitamins, minerals, and enzymes that can help improve skin texture, tone, and hydration.

#### History:

The use of potatoes for skincare can be traced back to ancient civilizations, where they were valued for their skin-friendly properties. In traditional medicine, potatoes were often used to treat skin ailments and enhance skin health.

#### Benefits for Pigmentation:

Potatoes contain enzymes and compounds that have mild bleaching properties, which can help lighten dark spots and pigmentation. The enzyme catecholase, found in potatoes, can inhibit melanin production, which is responsible for skin pigmentation.

#### Benefits for Dry Skin:

Potatoes have a high-water content and are rich in vitamin C and vitamin B6, which can contribute to improved skin hydration and moisture retention. The starch in potatoes also acts as a natural humectant, helping to lock in moisture.

#### Chemicals and Compounds:

1. Catecholase: This enzyme is responsible for the bleaching effect of potatoes. It can reduce the appearance of dark spots and hyperpigmentation by inhibiting melanin production.
2. Vitamin C: Potatoes contain vitamin C, which is an antioxidant that supports collagen production and brightens the skin.
3. Vitamin B6: Also known as pyridoxine, vitamin B6 helps maintain skin health by regulating moisture levels and promoting overall skin texture.
4. Starch: The starch in potatoes can have a soothing effect on dry skin, helping to lock in moisture and relieve irritation.

Potato slices or potato-based remedies are often used to address under eye dark circles. The cooling effect of potato slices, along with their natural bleaching properties, can temporarily reduce the appearance of dark circles and puffiness.

### **European Blueberry**

European blueberries, scientifically known as *Vaccinium myrtillus*, have been recognized for their potential benefits in skincare due to their high content of antioxidants, vitamins, and other beneficial compounds.

#### **History:**

European blueberries have been used for centuries in traditional medicine for their various health benefits. They are known for their rich anthocyanin content, which gives them their deep blue-purple color and contributes to their antioxidant properties.

#### **Benefits for Pigmentation:**

The antioxidants, particularly anthocyanins, present in European blueberries have been suggested to have a protective effect against oxidative stress, which can contribute to skin pigmentation issues. These antioxidants may help neutralize free radicals that can lead to uneven skin tone and hyperpigmentation.

#### **Benefits for Dry Skin:**

European blueberries are a good source of vitamins A and C, which are essential for maintaining healthy and hydrated skin. Vitamin C supports collagen production, while vitamin A helps with skin cell turnover and moisture retention.

#### **Chemicals and Compounds:**

1. **Anthocyanins:** These are powerful antioxidants responsible for the blueberry's color. They help protect the skin from oxidative stress and may contribute to a more even skin tone.
2. **Vitamin C:** European blueberries contain vitamin C, which supports collagen synthesis and brightens the skin.
3. **Vitamin A:** Vitamin A is essential for maintaining healthy skin cells and promoting moisture retention.

#### **Using European Blueberries for Under Eye Dark Circles:**

While European blueberries are not as commonly used for under eye dark circles as potatoes, their antioxidant content may offer some benefits. Incorporating blueberry extracts or products containing blueberry-derived ingredients into your skincare routine could potentially help improve the appearance of under eye dark circles by reducing oxidative stress and promoting overall skin health.

### **Cucumber**

#### **History:**

Cucumber (*Cucumis sativus*) has been used in skincare for centuries due to its soothing and hydrating properties. It's believed to have originated in India and has been utilized for its various benefits in skincare routines across different cultures.

#### **Benefits for Pigmentation:**

Cucumber contains compounds like cucurbitacin and flavonoids that have antioxidant properties. These antioxidants help protect the skin from free radical damage, which can contribute to pigmentation and uneven skin tone. Additionally, cucumber's cooling and soothing properties can help calm irritated skin that might worsen pigmentation.

### **Benefits for Dry Skin:**

With its high-water content, cucumber is an effective natural hydrator. It helps replenish moisture in the skin and provides relief to dry, dehydrated skin. The hydrating effect can lead to improved skin texture and comfort.

### **Chemicals and Compounds:**

1. Cucurbitacin's: These are natural compounds found in cucumbers that have anti-inflammatory and antioxidant properties. They contribute to the skin-soothing effects of cucumber.
2. Flavonoids: Cucumber contains flavonoids like quercetin, which possess antioxidant properties. These antioxidants protect the skin from environmental stressors that can worsen pigmentation and dryness.
3. Vitamins and Minerals: Cucumber is a source of vitamins like vitamin C and minerals like silica, both of which support skin health. Silica, in particular, can help improve skin's elasticity and hydration.

### **Using Cucumber for Under Eye Dark Circles:**

Cucumber slices have been a popular remedy for reducing the appearance of under eye dark circles due to their cooling and mild astringent properties. Placing chilled cucumber slices over the eyes can temporarily reduce puffiness and provide a soothing effect to the under-eye area. However, their impact on actual pigmentation might be limited.

### **Green Tea**

#### **History:**

Green tea (*Camellia sinensis*) has a long history of use in traditional medicine and skincare, particularly in Asian cultures such as China, Japan, and Korea. It's been consumed and applied topically for its numerous health and skincare benefits.

### **Benefits for Pigmentation:**

Green tea is rich in polyphenols, particularly catechins like epigallocatechin gallate (EGCG), which have potent antioxidant and anti-inflammatory properties. These compounds can help protect the skin from oxidative stress, which can lead to pigmentation and uneven skin tone. Green tea's anti-inflammatory effects may also contribute to a more even complexion.

### **Benefits for Dry Skin:**

Green tea contains amino acids and minerals that can help improve skin hydration and barrier function. It can assist in retaining moisture and preventing excessive water loss from the skin, which is beneficial for dry skin concerns.

### **Chemicals and Compounds:**

1. Catechins (EGCG): These are powerful antioxidants found in green tea that help neutralize free radicals and reduce oxidative stress on the skin.
2. Polyphenols: Green tea is rich in polyphenolic compounds, which have anti-inflammatory and skin-protective effects.
3. Amino Acids: Green tea contains amino acids like theanine, which can support skin hydration and overall health.
4. Vitamins: Green tea contains vitamins like vitamin E, which is known for its antioxidant properties and skin-nourishing effects.

### **Using Green Tea for Under Eye Dark Circles:**

Green tea's anti-inflammatory and antioxidant properties can be beneficial for reducing the appearance of under eye dark circles. Applying cooled green tea bags or using green tea-infused products on the under-eye area may help alleviate puffiness and provide a soothing effect. The

caffeine content in green tea can also temporarily constrict blood vessels, reducing the appearance of dark circles.

### **Passion Flower**

History:

Passion flower (*Passiflora incarnata*) is a plant native to North America that has been used traditionally for its calming and sedative effects. In skincare, passion flower extract is sometimes included in formulations for its potential benefits.

#### **Benefits for Pigmentation:**

Passion flower contains compounds like flavonoids and alkaloids that have antioxidant properties. These antioxidants can help protect the skin from oxidative stress and potentially contribute to a more even skin tone. However, there is limited scientific research specifically linking passion flower to pigmentation improvement.

#### **Benefits for Dry Skin:**

Passion flower is believed to have moisturizing and emollient properties that can help improve skin hydration and barrier function. While it may not be as widely recognized as other hydrating ingredients, it has the potential to provide some relief for dry skin.

#### **Chemicals and Compounds:**

1. **Flavonoids:** Passion flower contains flavonoids like quercetin, which possess antioxidant and anti-inflammatory properties.
2. **Alkaloids:** Some alkaloids found in passion flower may have mild skin-soothing effects, contributing to its potential benefits for dry and irritated skin.

Using Passion Flower for Under Eye Dark Circles:

There is limited scientific evidence specifically supporting the use of passion flower for under eye dark circles. However, passion flower's potential antioxidant and soothing properties could contribute to a reduction in puffiness and mild improvement in the appearance of dark circles. It's worth noting that the focus of passion flower's benefits has been more on relaxation and anxiety reduction rather than skincare.

### **Wild Asparagus**

History:

Wild asparagus, also known as *Asparagus racemases* or Shatavari, is a plant that has been used in traditional Ayurvedic medicine for its potential health benefits. While it's more commonly known for its internal use, it's sometimes mentioned for its topical applications in skincare as well.

Benefits for Pigmentation:

Wild asparagus is often highlighted for its adaptogenic properties, which may help the body cope with stress and potentially have indirect benefits on pigmentation. Stress can sometimes contribute to skin issues, including pigmentation problems. However, there's limited direct evidence linking wild asparagus to pigmentation improvement.

#### **Benefits for Dry Skin:**

In Ayurvedic tradition, wild asparagus is sometimes used to support skin health and hydration. It's believed to have moisturizing properties that can help with dry skin concerns, although its effectiveness might vary from person to person.

#### **Chemicals and Compounds:**

Wild asparagus contains a variety of bioactive compounds, including saponins, flavonoids, and steroidal compounds. These compounds are thought to contribute to its potential health benefits, although their specific effects on pigmentation and dry skin might not be well-established.

### **Using Wild Asparagus for Under Eye Dark Circles:**

Its potential adaptogenic and skin-soothing properties could potentially contribute to reducing puffiness and improving skin tone, but this is mostly speculative.

### **Saffron**

History:

Saffron, derived from the *Crocus sativus* flower, has a long history of use in traditional medicine, culinary arts, and skincare. It has been valued for its vibrant color, unique flavor, and potential health benefits across various cultures.

### **Benefits for Pigmentation:**

Saffron contains compounds like crocin and crocetin, which are responsible for its color and possess antioxidant properties. These compounds may help combat oxidative stress and contribute to a more even skin tone by addressing pigmentation concerns.

### **Benefits for Dry Skin:**

Saffron is often used in skincare for its moisturizing and soothing effects. The natural emollient properties of saffron can help alleviate dry skin and promote better hydration.

### **Chemicals and Compounds:**

1. **Crocin and Crocetin:** These are carotenoid compounds present in saffron that possess antioxidant properties. They contribute to Safran's potential benefits for skin health.
2. **Vitamins:** Saffron contains vitamins like vitamin A and vitamin C, both of which support skin health and hydration.
3. **Minerals:** Minerals such as potassium and calcium found in saffron can contribute to skin health and overall well-being.

### **Using Saffron for Under Eye Dark Circles:**

Saffron is sometimes used in skincare formulations for its potential benefits on skin tone and texture. However, its direct effects on under eye dark circles might be limited. Saffron's potential soothing properties could contribute to a reduction in puffiness, but its impact on pigmentation-related dark circles might vary from person to person.

### **Papaya**

History:

Papaya (*Carica papaya*) is a tropical fruit that has been used for centuries for its culinary and medicinal properties. In skincare, papaya is valued for its natural enzymes and vitamins that can benefit the skin.

### **Benefits for Pigmentation:**

Papaya contains an enzyme called papain, which is a natural exfoliant with potential skin-brightening effects. Papain can help gently remove dead skin cells and promote a more even skin tone. Additionally, the high vitamin C content in papaya contributes to its antioxidant properties, which can help combat oxidative stress that may contribute to pigmentation issues.

### **Benefits for Dry Skin:**

Papaya is rich in vitamins A, C, and E, all of which are beneficial for skin health. These vitamins contribute to improved hydration, collagen synthesis, and protection against environmental damage, making papaya a useful ingredient for addressing dry skin concerns.

### **Chemicals and Compounds:**



1. Papain: This enzyme, found in papaya, is known for its exfoliating properties. It helps remove dead skin cells, revealing a fresher and brighter complexion.
2. Vitamin C: Papaya contains vitamin C, which supports collagen production, helps fade dark spots, and brightens the skin.
3. Vitamin A: Vitamin A in papaya can promote skin cell turnover, leading to improved texture and hydration.
4. Vitamin E: Papaya's vitamin E content provides antioxidant protection against free radicals, helping to maintain skin health.

### **Using Papaya for Under Eye Dark Circles:**

Papaya's potential skin-brightening and antioxidant effects could be helpful for reducing the appearance of under eye dark circles. However, the use of papaya directly on the delicate skin around the eyes might need to be approached with caution, as the enzymes can be strong and might cause irritation in some individuals.

### **CONCLUSION**

In the comprehensive review article, the focus centers on exploring how various plant-based components can potentially address the issue of dark circles under the eyes. This involves considering the effectiveness of natural substances such as papaya, wild asparagus, green tea, passion flower, saffron, cucumber, and potato.

The historical context of utilizing natural elements for skincare is emphasized, underscoring the global recognition of these components for their beneficial properties in enhancing beauty and well-being. The utilization of these plants in traditional medicine further highlights their importance in skincare rituals.

Each plant brings distinct advantages:

1. Papaya: The presence of papain, an enzyme, offers a gentle exfoliating effect that enhances skin texture and promotes an even skin tone. Additionally, the vitamin content in papaya supports skin health by improving hydration and brightness.
2. Wild Asparagus: While primarily acknowledged for its internal benefits, wild asparagus might indirectly aid in managing stress-related factors impacting skin pigmentation. Its moisturizing attributes also make it suitable for addressing dry skin.
3. Green Tea: Abundant in antioxidants, particularly EGCG, green tea safeguards against oxidative stress and inflammation. Its application is often employed to soothe the skin and alleviate puffiness around the eyes.
4. Passion Flower: Renowned for its calming properties, passion flower's potential adaptogenic nature could assist in managing stress, indirectly influencing the mitigation of dark circles. Its use for addressing dry skin is rooted in its moisturizing and calming features.
5. Saffron: Rich in compounds like crocin and crocetin, saffron possesses antioxidant potential that counteracts oxidative stress. Its potential to moisturize the skin makes it pertinent for addressing dry skin concerns.
6. Cucumber: With its notably high-water content, cucumber effectively provides hydration and imparts a cooling sensation, which is particularly valuable for soothing the delicate under eye area. Its reputation is primarily linked to its temporary reduction of puffiness.
7. Potato: The enzymes within potatoes, including catecholase, exert a subtle bleaching influence that may aid in addressing pigmentation issues. Simultaneously, the starch component contributes to skin hydration, and the cooling quality assists in diminishing puffiness.

In summation, these plant-based constituents exhibit promising attributes in dealing with dark circles and associated skincare challenges. Nonetheless, it's crucial to acknowledge that outcomes can be subjective.

1. Improved Blood Circulation: Poor blood circulation around the eyes can lead to accumulation of deoxygenated blood and other waste products, contributing to the appearance of dark circles. Pharmacological interventions that improve blood circulation might help alleviate this issue. Ingredients that can help enhance blood flow include:

- Vasoconstrictors: Compounds that constrict blood vessels, reducing their diameter and promoting blood flow. Examples include caffeine and other similar agents. Caffeine is often found in under-eye creams due to its potential to temporarily improve blood circulation and reduce puffiness.

2. Reduction of Inflammation and Puffiness: Inflammation and swelling can exacerbate the appearance of under-eye dark circles. Pharmacological agents with anti-inflammatory properties might help alleviate this issue. These agents can target factors that contribute to puffiness and inflammation, such as:

- Anti-Inflammatory Agents: Ingredients with anti-inflammatory properties, such as chamomile, aloe vera, and green tea extract, can help reduce puffiness and inflammation around the eyes.

3. Inhibition of Melanin Production: Excessive melanin production in the skin can lead to hyperpigmentation and the appearance of dark circles. Pharmacological agents that inhibit melanin production or distribution might help address this concern. Some compounds that could have these effects include:

- Tyrosinase Inhibitors: Tyrosinase is an enzyme involved in melanin synthesis. Agents that inhibit tyrosinase can reduce melanin production, potentially improving pigmentation issues. Examples include kojic acid, licorice extract, and vitamin C derivatives.

4. Antioxidant Protection: Oxidative stress and damage from free radicals can contribute to skin aging and pigmentation issues. Antioxidants can neutralize free radicals and protect the skin from damage. Antioxidant-rich compounds, such as vitamin C, vitamin E, and green tea extract, might help improve skin health and reduce the appearance of dark circles.

5. Skin Barrier Enhancement and Hydration: A compromised skin barrier can lead to increased sensitivity and the appearance of dark circles. Pharmacological agents that enhance the skin barrier and provide hydration can improve overall skin health and appearance. Ingredients like hyaluronic acid and ceramides might be beneficial in this regard.

## REFERENCE

1. Abdul L, Abdul R, Sukul RR, Nazish S. Anti-inflammatory and antihistaminic study of a Unani eye drop formulation. *Ophthalmic Eye Dis.* 2010; 10:17–22.
2. Agarwal R, Gupta SK, Agarwal SS, Srivastava S, Saxena R. Oculohypotensive effects of *Foeniculum vulgare* in experimental models of glaucoma. *Indian J Physio Pharmacol.* 2008; 52:77–83.
3. Akbari A, Nasiri K, Heydari M. Ginger (*Zingiber officinale* Roscoe) extract can improve the levels of some trace element and total homocysteine and prevent oxidative damage induced by ethanol in rat eye. *Avicenna J Phytomer.* 2020; 10:365–371.
4. Babbar OP, Chatwal VK, Ray IB. Effect of berberine chloride eye drops on clinically positive trachoma patients. *Ind J Med Res.* 1982; 76:83–88.
5. Bajpai A, Nainwal RC, Singh D. *Coptis teeta*: a potential endemic and endangered medicinal plant of Eastern Himalayas. *J Pharmacogn Phytochem.* 2019; 8:245–248.
6. Barathi VA, Beuerman RW. Molecular mechanisms of muscarinic receptors in mouse scleral fibroblasts: Prior to and after induction of experimental myopia with atropine treatment. *Mol Vis.* 2011; 17:680–691.
7. Bhatia M, Siddiqui NA, Gupta SA. *Abrus precatorius*: an evaluation of traditional herb. *Indo American Journal of Pharm Research.* 2013; 3:3295–3315.
8. Bonyadi MHJ, Yazdani S, Saadat S. The ocular hypotensive effect of saffron extract in primary open angle glaucoma: a pilot study. *BMC Complement Altern Med.* 2014; 15:399.

9. Broadhead GK, Grigg JR, McCluskey P, Hong T, Schlub TE, Chang AA. Saffron therapy for the treatment of mild/ moderate age-related macular degeneration: a randomized clinical trial. *Graefes Arch Clin Exp Ophthalmol*. 2019; 257:31–40.
10. Chia A, Lu QS, Tan D. Five-year clinical trial on atropine for the treatment of myopia 2: myopia control with atropine 0.01% eyedrops. *Ophthalmology*. 2016; 123:391–399.
11. Dhanik J, Arya N, Nand V. A review on *Zingiber officinale*. *J Pharmacogn Phytochem*. 2017; 6:174–184.
12. Dongare S, Gupta SK, Mathur R, Saxena R, Mathur S, Agarwal R, Nag TC, Srivastava S, Kumar P. *Zingiber officinale* attenuates retinal microvascular changes in diabetic rats via anti-inflammatory and antiangiogenic mechanisms. *Mol Vis*. 2016; 22:599–609.
13. Duncan G, Collison DJ. Role of the non-neuronal cholinergic system in the eye: a review. *Life Sci*. 2003; 72:2013–2019.
14. Eckert A, Keil U, Scherping I, Hauptmann S, Muller WE. Stabilization of mitochondrial membrane potential and improvement of neuronal energy metabolism by *Ginkgo biloba* extract EGb 761. *Ann N Y Acad Sci*. 2005; 1056:474–485.
15. Guo X, Kong X, Huang R, Jin L, Ding X, He M, Liu X, Chimanlal Patel M, Congdon N. Effect of *Ginkgo biloba* on visual field and contrast sensitivity in Chinese patients with normal tension glaucoma: a randomized, crossover clinical trial. *Invest Ophthalmol Vis Sci*. 2014; 55:110–116.
16. Hassan OA, Abu-Raghif AR, Rasheed AM, Al-Yawer MA. Effect of *Foeniculum vulgare* seed aqueous extract eye drops on selenite induced cataract in rabbits. *Int J Pharm Sci Rev Res*. 2017; 47:83–87.
17. Heitmar R, Brown J, Kyrou I. Saffron (*Crocus sativus* L) in ocular diseases: a narrative review of the existing evidence from clinical studies. *Nutrients*. 2019; 11:649.
18. Hosseini A, Razavi BM, Hosseinzadeh H. Saffron (*Crocus sativus*) petal as a new pharmacological target: a review. *Iran J Basic Med Sci*. 2018; 21:1091–1099.
19. Ige M, Liu J. Herbal medicines in glaucoma treatment. *Yale J Biol Med*. 2020; 93:347–353.
20. Jiang-Yan Li, Xiao-Bing Wang, Jian-Guang Luo, Ling-Yi Kong. Seasonal variation of alkaloid contents and anti-inflammatory activity of *Rhizoma coptidis* based on fingerprints combined with chemometrics methods. *J Chromatogr Sci*. 2015; 53:1131–1139.
21. José Bagur M, Alonso Salinas GL, Jiménez-Monreal AM, Chaouqi S, Llorens S, Martínez-Tomé M, Alonso GL. Saffron: an old medicinal plant and a potential novel functional food. *Molecules*. 2017; 23
22. Lind GJ, Chew SJ, Marzani D, Wallman J. Muscarinic acetylcholine receptor antagonists inhibit chick scleral chondrocytes. *Invest Ophthalmol Vis Sci*. 1998; 39:2217–2231.
23. Lone TA, Rahul M, Lone RA. In vitro anti-oxidant studies by using different methods and evaluation of anti-microbial potential of *Coptis teeta*. *Global J Biotech & Biochem*. 2014; 9:99–104.
24. Newman DJ, Cragg GM. Natural products as sources of new drugs from 1981 to 2014. *J Nat Prod*. 2016; 79:629–661.
25. Niazi Mashhadi Z, Irani M, Kiyani Mask M, Methie C. A systematic review of clinical trials on *Ginkgo* (*Ginkgo biloba*) effectiveness on sexual function and its safety. *Avicenna J Phytomed*. 2021; 11:324–331.
26. Mahmoudi Z, Soleimani M, Saidi A, Khamisipour G, Azisoltani A. Effects of *Foeniculum vulgare* ethanol extract on osteogenesis in human mesenchymal stem cells. *Avicenna J Phytomed*. 2013; 3:135–137.
27. Miguel MG, Cruz C, Faleiro L, Simões M, Figueiredo AC, Barroso JG, Pedro LG. *Foeniculum vulgare* essential oils: chemical composition, antioxidant and antimicrobial activities. *Nat Prod Commun*. 2010; 5:319–328.
28. Mirzaei M, Gupta VB, Chick JM, Greco TM, Wu Y, Chitranshi N, Vander Wall R, Hone E, Deng L, Dheer Y, Abbasi M, Rezaeian M, Braidy N, You Y, Hosseini Salekdeh G, Haynes P, Molloy M, Martins R, Cristea I, Gygi S, Graham S, Gupta V. Age-related neurodegenerative

- disease associated pathways identified in retinal and vitreous proteome from human glaucoma eyes. *Sci Rep.* 2017;7
29. Mousavi SZ, Bathaie SZ. Historical uses of saffron: Identifying potential new avenues for modern research. *Avicenna J Phytomed.* 2011; 1:57–66.
  30. Park JW, Kwon HJ, Chung WS, Kim CY, Seong GJ. Short term effects of Ginkgo biloba extract on peripapillary retinal blood flow in normal tension glaucoma. *Korean J Ophthalmol.* 2011; 25:323–328.
  31. Pathan AH, Ali SA. Antiglaucoma activity of aqueous methanolic Zingiber officinale extract on carbomer induced glaucoma in rabbits. *J Nat Remedies.* 2014; 14:193–198.
  32. Payum T. Distribution, ethnobotany, pharmacognosy and phytoconstituents of Coptis teeta Wal a highly valued and threatened medicinal plant of Eastern Himalayas. *Pharmacog J.* 2017; 9:28–34.
  33. Prabha PM, Perumal C, Kumar MP, Sampath KR. Pharmacological activities of Abrus precatorius (L) seeds. *Int J Pharm Med Res.* 2015; 3:195–200.
  34. Pinheiro GKLO, Filho IA, Neto IA, Rego ACM, Azevedo EP, Pinheiro FI, Filho AAS Nature as a source of drugs for ophthalmology. *Arq Bras Oftalmol.* 2018; 81:443–454.
  35. Pooja Lal VK, Verma A. A review on Ayurvedic medicinal plants for eye disorders from ancient to modern era. *Int J Pharm Sci Res.* 2014; 5:5088–5096.
  36. Rather MA, Dar BA, Sofi SN, Bhat BA, Qureshi MA. Foeniculum vulgare: A comprehensive review of its traditional use, phytochemistry, pharmacology, and safety. *Arab J Chem.* 2012; 9:1574–1583.
  37. Rahimi R, Ardekani MRS. Medicinal properties of Foeniculum vulgare Mill in traditional Iranian medicine and modern phytotherapy. *Chin J Integr Med.* 2013; 19:73–79.
  38. Ruetsch YA, Boni T, Borgeat A. From cocaine to ropivacaine: The history of local anaesthetic drugs. *Curr Top Med Chem.* 2001; 1:175–182.
  39. Sari MD, Sihotang AD, Lelo A. Ginkgo biloba extract effect on oxidative stress marker malondialdehyde, redox enzyme glutathione peroxidase, visual field damage, and retinal nerve fibre layer thickness in primary open angle glaucoma. *Int J Pharmtech Res.* 2016; 9:158–166.
  40. Sepahi S, Mohajeri SA, Hosseini SM, Khodaverdi E, Shoeibi N, Namdari M, Tabassi SAS. Effects of crocin on diabetic maculopathy: a placebo-controlled randomized clinical trial. *Am J Ophthalmol.* 2018; 190:89–98.
  41. Shim SH, Kim JM, Choi CY, Kim CY, Park KH. Ginkgo biloba extract and bilberry anthocyanins improve visual function in patients with normal tension glaucoma. *J Med Food.* 2012; 15:818–823
  42. Srikanth N, Haripriya N, Rath C, Bharti, Khanduri S, Padhi MM, Kumar A. *Medicinal plants in eye care and exploration of their therapeutic potential: evidence based translational approach in: Kumar A, Padhi MM, Srikanth N, Dhar BP, Mangal AK (Eds), Conservation, cultivation and exploration of therapeutic potential of medicinal plants, Council for research in ayurvedic Sciences, Department of AYUSH, Ministry of Health & Family Welfare. New Delhi; 2014. pp. 359–374.*
  43. Srikanth N, Bansal P, Kaur J. An insight into indigenous ophthalmic medicine plant drugs; a scientific approach. *DJO.* 2007; 12:55–59.
  44. Uma Maheswari M, Dhinesh S, Kumar KA, Subhadradevi TSV, Puliyath J, Madeswaran A. Anticataractogenic and antioxidant activities of Abrus precatorius Linn against calcium-induced cataractogenesis using goat lenses. *Euro J Exp Bio.* 2012; 2:378–384.
  45. Uzodike EB, Ilodibe EC. Effect of ingested raw ginger Zingiber officinale on tear production. *JNOA.* 2010; 16:26–28.
  46. Wagner H. Natural products chemistry and phytomedicine research in the new millennium: new developments and challenges. *ARKIVOC.* 2004; 7:277–284.