

ROLE OF ADAPTOGENIC HERBS IN SKIN CARE AND HAIR CARE COSMETICS

Miss. Chaitali Meshram*, Dr. Sana Ahmed, Dr. Sonal Dhabekar

India.

Article Received on 12 April 2026,

Article Revised on 02 May 2026,

Article Published on 16 May 2026,

<https://doi.org/10.5281/zenodo.20197150>

*Corresponding Author

Miss. Chaitali Meshram

India.



How to cite this Article: Miss. Chaitali Meshram*, Dr. Sana Ahmed, Dr. Sonal Dhabekar. (2026). Role of Adaptogenic Herbs In Skin Care And Hair Care Cosmetics. World Journal of Pharmaceutical Research, 15(10), 127-141.

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ABSTRACT

Adaptogenic herbs are those natural medicinal plant which helps body to manage physical, chemical, and psychological or psychic stress and maintain homeostasis. This herbs having antioxidant, anti-inflammatory and protective properties this makes these medicinal plants important in the cosmetic formulations. skin and hair continuously comes in contact with external factor like UV radiation, pollution and oxidative stress, which is responsible for premature aging, inflammation and hair loss like problems .Adaptogenic herbs help to protect body from this problems.

KEYWORDS: Adaptogens, Skin care, Hair care, Antioxidants, Anti-aging, Herbal cosmetics, Oxidative stress, Adaptogenic herbs.

INTRODUCTION

Adaptogenic herbs represent a unique class of natural plants based substance primarily derived from plants and fungi that helps body to manage physical, chemical, mental stress and maintain homeostasis. The concept was first introduced by Lazarev, who described them as substances that increase overall resistance in non-specific way, meaning they work on multiple system in the body. Later, scientists Brekhman and dardymov added that adaptogens should be safe, non-toxic, and improve the body response to physical, chemical, and biological stress without causing side effect. This group of ingredients has deep roots in traditional medicine systems, particularly in Asian healing practices, but their scientific validation began in the 1940s when Russian scientist Nikolai Lazarev pioneered research into their stress-protective properties. Studies sought to identify natural compounds that could

enhance human resilience without toxic side effects. In 1998, FDA defines adaptogens as a substance that regulates metabolism and helps the body adapt to environmental changes. Adaptogenic herbs have antioxidant, anti-inflammatory, and protective properties. These properties have attracted considerable attention for their incorporation in cosmetic formulations. Skin and hair are constantly exposed to environmental stressors like ultraviolet radiations, pollution, and oxidative damage, leading to problems like premature aging, inflammation, and hair loss. Adaptogenic herbs help protect against this damage by acting as antioxidants, balancing stress hormones, and supporting healthy cell function. The increasing demand for natural and eco-friendly cosmetic products has led to greater use of plant-based ingredients with multiple benefits. Adaptogenic herbs, traditionally used in systems like Ayurveda and traditional Chinese medicines, are today widely used in skin care and hair care and becoming important ingredients in modern cosmetic products.

OVERVIEW OF KEY CONCEPT

Adaptogens are natural plant-based medicinal substances that help the body handle stress and maintain balance (homeostasis). They mainly work by controlling the HPA (Hypothalamus-pituitary-adrenal system) axis, which regulates the stress hormone called cortisol. When cortisol levels become very high, it can reduce collagen in the skin, weaken the skin barrier, and disturb the hair growth cycle. These herbs contain various phytochemicals such as flavonoids, phenolic acids, saponins, and alkaloids, which are responsible for their medicinal properties. In cosmetics, these compounds work as antioxidants which protect from damage, anti-inflammatory agents which reduce swelling, antimicrobial agents which fight with germs, and immunomodulators which help balance the immune system. Adaptogens affect important biological processes in the body such as WNT signaling, growth factors, and cell repair mechanisms; these processes are very important for maintaining healthy skin and proper functioning of hair follicles which support healthy hair growth.

REVIEW METHODOLOGY

Effect of stress on hair

The skin has hair follicles that keep going through a natural growth cycle. Research on animals shows that high stress can cause inflammation and activate the immune system, which can stop hair growth in the catagen phase. In humans, people often notice hair fall during stressful times even when there is no medical problem. Stress affects the neuroendocrine system and the immune system of the body, which leads to the release of cytokines like TNF- α and IFN-

GYAMA. These substances can damage hair follicle cell and slow down or stop hair growth.^[1]

Effect of stress on skin

Stress has a strong effect on the skin. The skin and brain are closely connected, so when a person is under stress, the body activate HPA axis and release hormones like cortisol. This lead to many changes in the skin like increase inflammation, weaken the skin barrier, reduce self protection ability of skin, dryness, increased water loss, disturb the immune function of the skin. It also leads to pigmentation by increasing melanin production causes hyperpigmentation. During stress condition acne, psoriasis, atopic dermatitis, and itching like skin problems become very bad. Specially in women long term stress can lead sensitive skin, redness, acne, enlarged pores and dryness.^[2]

Effect of Skin problem on human behavior

Skin and brain are closely connected they communicate through different system such as the immune system, nervous system, and the HPA axis, stress can worsen skin diseases, and skin problems can affect mental health. Stress increase inflammatory chemical which affect both skin cell and brain function this can lead to worsening the skin diseases and change in mood and behavior.^[3]

Environmental factor

Human skin act as a barrier against the environment factor can damage skin (UV radiation, pollution, smoke, chemical). These all stress can reduce skin protection function and increase the risk of skin problems and premature aging. ROS(reactive oxygen species) harmful molecule which is created by sunlight uv rays can damage in DNA, protein, and fat in the skin, causing wrinkle, loss of elasticity, and uneven skin tone.^[4]

Air pollutant can cause inflammation, weaken the skin barrier, damage the skin structure which speed up toward skin aging.^[5]

Both UV and pollution generate ROS that damage DNA and protein and reduce the skin ability to repair itself. This makes skin weaker, drier, and more prone to wrinkles and other aging signs.^[6]

Adaptogens and Their Role in Skin Protection

Adaptogenic plants have gained great importance in the scientific field due to their ability to help biological system cope with environmental and physiological stress. According to recent research, topical application of adaptogen-based extracts increases skin resilience and can more effectively protect it from oxidative damage, UV radiation and environmental pollution.

These plants work in several ways, such as

- Antioxidant effects protect cells from damage
- Anti-inflammatory effect to reduce swelling
- Strengthening the skin barrier, increasing the skin's protective capacity

Due to all these properties, these plants are extremely useful in cosmetic products used to reduce skin aging and improve overall skin health.

Adaptogens do not act on a single target, but rather act collectively to influence multiple biological processes related to stress. These characteristics are consistent with their traditional use, in which they are used to improve the overall balance (homeostasis) of the body.^[7]

Adaptogens Improve Skin Resilience and Anti-Aging Effects

According to research, retinogenic plants help keep skin healthy and protect it from damage caused by environmental stressor (such as UV rays, pollution, and toxins). These plants reduce oxidative stress, which is caused by harmful substances called reactive Oxygen species (ROS) that damage skin cells they also reduce inflammation, which can make skin look red, sensitive or aged.

For example, *Panax ginseng* contains compound called ginsenosides, which act as antioxidants and protect skin cells from ROS. These compound increase collagen production, which makes the skin remain firm and elastic.

Also, *Withania somnifera* (Ashwagandha) contains withanolides, which reduce skin damage caused by stress and improve moisture retention in the skin.

Both of these plant activate multiple protective processes in cells, without acting on a specific target. Therefore, they are very effective in increasing skin resilience.

Due to all these properties, adaptogen plants are used in cosmetic creams, serums and face mask, which

- Signs of aging are reduced
- Improve skin texture
- Protect against environmental damage^{[7][8]}

Adaptogenic herbs

Ginseng

Ginseng comes in two main forms; white ginseng, which is raw, dried root, while red ginseng which is the root that has been steam-dried after growing for about six years. This process changes its active ingredients, called ginsenosides.

Ginseng has many health benefits. It is a powerful antioxidant, which reduces oxidative stress, and its anti-inflammatory properties help reduce swelling, it also may have anti-cancer properties and boosts the immune system, which helps protect the body from infection. Some components in ginseng increase nitric oxide levels, which improves blood circulation.

Asian ginseng has been used in China, Korea, and India for thousands of years. However, it was nearly extinct due to overuse. Later, American ginseng was discovered. Today, Asian ginseng is mainly cultivated in China and South Korea, while American ginseng is still rare and considered endangered in some areas.



Uses of ginseng in cosmetics

Ginseng is widely used in cosmetics due to its many benefits for the skin. It increases collagen production, which reduces wrinkles and fine lines and makes signs of aging less visible.

Its antioxidant properties protect the skin from damage caused by UV rays and pollution. Ginseng improves blood circulation, which gives the skin a natural glow and good

complexion. Also its anti inflammatory properties help reduce redness, acne and skin irritation. It moisturizes the skin and makes it healthy.

Due to all these benefits, ginseng is widely used in cream, serum, face mask and other skincare products.

Phytochemical constituents and adaptogens in ginseng

Ginseng contain several important phytochemicals that contribute to its health and skincare benefits. The most significant are ginsenosides(saponin),which are the primary active compound responsible for antioxidant, anti aging, anti inflammatory and immune-boosting effect. These ginsenosides are also the main adaptogenic compounds in ginseng, typically present in about 2% to 5% (some time 1-7%) depending on the type (white or red ginseng), age, and processing method. Polysaccharides help enhance immunity, support skin hydration and repair, assist the body in adapting to stress. Flavonoides and phenolic compound act as powerful antioxidant, protecting the body and skin from oxidative stress. Polyacetylene provide anti inflammatory and potential anticancer properties peptides and amino acids support tissue repair, nourishment and overall balance while essential oils contributes soothing and anti inflammatory effects.

Overall ginsenosides are the main adaptogens in ginseng, while other components act as supporting compound that help body manage stress and improve overall health and skin condition.^{[8],[9]}

Adaptogenic Effects of Ashwagandha on Skin Stress and Repair

Withania somnifera (ashwagandha) is a well known adaptogenic herb which has been used for centuries in traditional medicine. Its active compounds is withanolidws are responsible for most of its beneficial effects on the skin. These compounds help regulate stress hormones, especially cortisol, which is released during physical, environmental, or emotional stress. High cortisol level can damage skin cells, cause inflammation and accelerate aging. by controlling cortisol levels, ashwagandha helps protect the skin from stress induced damage.

Ashwagandha enhance the skin's natural antioxidant defence system by neutralizing harmful molecules which known as ROS(reactive oxygen species).these molecules are produced due to exposure to UV radiation, pollution, and other environmental stressors, and they can damage proteins, lipids and DNA in skin cells. By reducing ROS, Ashwagandha helps

prevent premature aging, wrinkles, and loss skin elasticity. Another important benefits of ashwagandha is its role in moisture retention and skin repairing. It promotes hyaluronic acid production, which helps to retain skin moisture, keeping it hydrated soft and plump. Additionally its anti-inflammatory properties soothe irritated or sensitive skin, reduce redness and support the repair of damaged skin cells. In cosmetics formulation, ashwagandha is widely used in cream, serum, masks and oils. Regular use helps strengthen the skin barrier, maintain hydration, protect against environmental damage, and improve overall skin resilience. It is especially for dry, stressed, sensitive, and aging skin, making it a valuable ingredient in modern skincare products.



The main thing that shows Ashwagandha is really good at dealing with stress is that it can control the amount of cortisol in our body.

Ashwagandha, which is also known as *Withania somnifera* contains bioactive compounds called withanolides. These keep the levels in our body in check. When we are stressed the cortisol levels go up. That can cause problems like our body getting inflamed, feeling tired and getting older faster. Ashwagandha helps lower the levels and keeps them stable so the body can work normally even when we are under a lot of stress. Ashwagandha is really good at doing this because it helps our body deal with stress in a way. Ashwagandha is very helpful, in keeping us healthy when we are feeling stressed. It has

Phytochemical constituents that show adaptogenic properties in ashwagandha

- 1) Withanolides: helps in regulating HPA axis, reduce stress hormone level.
- 2) Alkaloid (Somniferine, Anaferrine, Anahygrine)
- 3) Saponin (Sitoindoside VII, Sitoindoside VIII)
- 4) Flavonoid and phenolic content^{[7][10]}

Rosea: Adaptogenic Benefits for Skin and Hair

Rhodiola rosea is a herb that helps our body deal with stress. This stress can come from the world around us or from our thoughts and feelings. Rhodiola rosea has things in it called rosavins and salidroside that make it very good at fighting off things that can hurt our skin.

These bad things are like monsters that can damage our skin cells when we are out in the sun or around pollution. Rhodiola rosea helps keep our skin safe from these monsters.

When we use Rhodiola rosea in skin care products it can help make red and irritated skin feel better. It is very good for skin that gets stressed easily. Rhodiola rosea calms down the skin cells. Makes our skin stronger and look younger.

Rhodiola rosea also helps our skin deal with stress from the world around us like the sun's rays or dirty air. This means our skin can stay healthy when things are tough.

Rhodiola rosea is good for our hair too. It helps keep our hair follicles healthy by protecting them from damage and stress. This can help us lose hair and have stronger and better-looking hair.

We can find Rhodiola rosea in skin and hair products, like serums and creams. These products help our skin and hair deal with the stress of life stay hydrated and look nice and healthy.^[11]

Phytochemicals which shows adaptogenic effect

- Rosavins (Rosavins, rosin, rosarin)-it helps body to adapt stress, reduce fatigue, and improve mental performance and mainly responsible for adaptogenic (anti stress) activity.
- Salidroside (Rhodiololide)
- Tyrosol-antioxidant and adaptogenic properties



Schisandra chinensis: Adaptogenic Benefits for Skin and Hair

Schisandra chinensis is a powerful adaptogenic herb which is great for our skin and hair. It is also called Schisandra or the five-flavor berry. It has a lot of beneficial properties for our skin and hair. The berries have a lot of lignans in them. Lignans are compounds that are very good at containing strong anti-oxidant and anti-aging properties. These antioxidants help protect skin cells from damage. They stop molecules, called reactive oxygen species, from hurting the skin cells. This happens when the skin is out in the sun or around pollution and other things that can harm it. The skin is exposed to radiation and this can cause problems. The antioxidants are like a shield for the skin cells. They protect the skin cells from oxygen species, which are bad, for the skin.

When our skin is outside it can get hurt by things like the sun, pollution and things that are bad for us. The lignans in Schisandra chinensis help keep our skin safe from these things. They do this by stopping the molecules that can hurt our skin.

Schisandra chinensis is very good for our skin. It helps keep our skin from getting old fast. It does this by keeping the collagen in our skin. Collagen is what keeps our skin firm and smooth. Schisandra chinensis also helps our skin fix itself when it gets hurt. This makes it very good for skin that's sensitive or getting old.

Schisandra chinensis is also very good for our hair. It helps our scalp get the blood flow it needs. This helps our hair get the nutrients it needs to grow strong and healthy.

So Schisandra chinensis is a good herb for our skin and hair. It helps us deal with the stress of life and the bad things in the environment. That is why it is a good ingredient in things like face cream, hair masks and other beauty products. Schisandra chinensis is really good, at helping our skin and hair stay healthy and strong.^[12]

Adaptogenic phytochemicals

1. Schisandrins A,B,C
2. Schisandrol
3. Gomisins A,N
4. Deoxyschisandri



Eleutherococcus senticosus (Siberian Ginseng): Adaptogenic Benefits for Skin and Hair

Siberian ginseng is a helpful herb that comes from the *Eleutherococcus senticosus* plant. It helps our body and skin deal with stress. The main reason Siberian ginseng is so good for us is that it helps our body fight off things that can hurt our skin.

It does this by boosting the things that keep us safe from damage and reducing the things that can cause inflammation. This keeps our skin cells safe from things like UV rays and pollution.

Siberian ginseng helps our skin by reducing the stress that can hurt it. This means that Siberian ginseng helps our skin stay healthy and firm and it does not get damaged easily. Siberian ginseng is really good, for our skin and our body because it has these benefits.

This herb is really good, for the skin because it helps fix the skin cells. When the skin is damaged this herb makes it heal faster. It also helps keep the skin strong and healthy. That is why people use this herb in face creams and other beauty products for skin that is getting old or is easily irritated.

In hair care Siberian ginseng is really good. It helps get blood to the scalp. This means hair follicles get oxygen and nutrients. So hair grows stronger and healthier. It is also good because it helps stop hair from falling out. This can happen when you are stressed or because of the way you live. Siberian ginseng helps with this by making hair growth.

Overall Siberian ginseng is really good for skin and hair because it has properties. These properties help Siberian ginseng make skin and hair strong against stress. Siberian ginseng helps skin and hair stay protected and look young and healthy. Siberian ginseng is valuable in things, like creams and shampoos because of this.^[13]

Adaptogenic phytochemicals

- Eleutherosides B&E
- Eleutherosides A,C,D
- Lignans(sesamin,syringaresinol derivatives)
- Polysaccharides



Holy Basil (*Ocimum sanctum* / Tulsi) : Adaptogenic Benefits for Skin and Hair

Holy Basil, which people also call Tulsi is a good herb. It is very good for your skin and hair. Holy Basil has some things in it that can help with swelling and keep bad things from growing on your skin. It is really good for skin because it keeps skin safe from the environmental air and sun rays damage every day. Holy Basil is like a shield which protects the skin and helps skin and hair keep healthy because Holy Basil has things in it that help reduce inflammation and keep skin and hair from getting damaged. Holy Basil is a herb that does a lot of things for you especially for skin and your hair.

In skincare Tulsi is really good for reducing redness and irritation. It helps calm down inflamed or sensitive skin. It also helps prevent acne by fighting off the bacteria that grow on the skin surface. The antioxidants in Tulsi are helpful as they neutralize radicals. These are molecules that can damage skin cells and make you look older faster. It is great, for keeping your skin looking young. Tulsi protects your skin from damage.

For hair care also Tulsi is very good. It helps the scalp work properly. The antioxidants in Tulsi reduce the stuff that can hurt the hair, which means the hair roots get stronger. This helps stop hair damage and makes hair grow healthier.

The antimicrobial properties of Tulsi also known as basil are great for keeping the scalp clean. Tulsi helps with problems like dandruff or irritation on the scalp. It is very good for hair care because it keeps the scalp healthy and helps in hair growth. Tulsi is great for hair care.

Overall the properties of Tulsi make it a valuable ingredient in cosmetics because Tulsi helps the skin and hair adapt to stress and recover from damage and stay healthy. It is good, for making creams and serums and masks and hair care things because Tulsi helps the skin and hair stay healthy.^[14]

Adaptogenic phytochemical

- Eugenol
- Ursolic Acid
- Rosmarinic acid
- Ocimumosides A & B
- Flavonoids (Apigenin, Luteolin)

**Panax Notoginseng (Notoginseng): Adaptogenic Benefits for Skin and Hair**

Panax notoginseng is strong adaptogenic herb which is widely used in skin care and hair care cosmetics as considering their benefits. Its roots have saponins. These saponins help to make skin cells get better and fix themselves. This makes skin look feel healthier. The saponins in the roots are good for skin health. By helping blood flow better Notoginseng makes sure your skin gets what it needs. It brings oxygen and important nutrients to the skin. This keeps your skin looking good, firm and young. Notoginseng does this by improving how blood moves through vessels.

Panax notoginseng having antioxidant properties which protect the body from oxidative stress caused by UV rays and pollution, it also reduces the appearance of fine lines, wrinkles, and premature aging, it helps make skin stronger and deal with things, like pollution and dry air. This also helps skin hold onto moisture. For hair, Panax Notoginseng enhances scalp circulation, delivering nutrients and oxygen to hair follicles, which supports stronger, healthier hair growth. Its anti-inflammatory and antioxidant properties help shield the scalp from oxidative stress and irritation, minimizing hair damage and promoting healthy follicles. Due to these characteristics, Notoginseng is frequently found in anti-aging creams, skin repair serums, moisturizers, hair tonics, and scalp treatments, positioning it as a flexible component in cosmetic products designed to enhance skin strength and hair health.^[15]

Adaptogenic phytochemicals

- Ginsenosides (Notoginsenosides R1, Rg1, Rb1 & panaxosides)
- Saponins
- Flavonoids
- Polysaccharides



Adaptogenic Herb	Active Phytochemicals	Cosmetic Benefits
Panax ginseng (Asian ginseng)	Ginsenosides (saponins), polysaccharides, flavonoids	Antioxidant, anti-aging, collagen support, improves skin elasticity, hair follicle stimulation
Panax quinquefolius (American ginseng)	Ginsenosides, polysaccharides	Antioxidant, reduces oxidative stress, immune-boosting, supports skin barrier
Withania somnifera (Ashwagandha)	Withanolides, alkaloids, saponins	Anti-inflammatory, antioxidant, stress-adaptive, improves hydration and skin repair
Rhodiola rosea	Rosavins, salidroside, flavonoids	Reduces inflammation, antioxidant protection, protects hair follicles, improves skin resilience
Schisandra chinensis	Lignans, polysaccharides	Anti-aging, UV protection, improves collagen integrity, supports scalp circulation
Eleutherococcus senticosus (Siberian ginseng)	Eleutherosides, polysaccharides, flavonoids	Antioxidant, anti-inflammatory, enhances skin repair, supports hair growth
Ocimum sanctum (Tulsi/Holy Basil)	Eugenol, ursolic acid, flavonoids	Anti-inflammatory, antioxidant, antimicrobial, reduces acne, supports scalp health
Panax notoginseng	Saponins, polysaccharides, flavonoids	Skin regeneration, UV protection, antioxidant, anti-aging

DISCUSSION

Adaptogenic herbs do a lot good for our skin and hair. They help's in handling our skin and hair deal with things like sunlight, pollution and other bad things that can cause damage. When our skin and hair are exposed to these things they can show faster aging. Adaptogenic herbs like Panax ginseng, Ashwagandha, Rhodiola rosea, Schisandra. Panax Notoginseng are very helpful. They have antioxidants, -inflammatory properties and they can even help our skin and hair deal with stress.

These herbs are great for our skin because they help blood flow make collagen protect our skin from damage and keep it moist. All these things together help our skin look younger for longer. They prevent wrinkles, loss of elasticity and dry skin. For our hair these herbs are good too. They help the hair follicles improve blood flow to the scalp prevent damage and make our hair stronger. This means our hair can grow healthy and we will not lose much hair.

What is really cool about herbs is that they work in many ways. They help our body deal with stress fix damaged cells and protect us from harm. This makes them very useful for skincare and haircare products. We need to take care of our skin and hair because they are always

exposed to things. Many studies have shown that adaptogenic herbs are effective. However how well they work can depend on how they're made and how much of the active ingredients they have. Adaptogenic herbs like Panax ginseng, Ashwagandha, Rhodiola rosea, Schisandra. Panax Notoginseng are very good, at helping our skin and hair.

CONCLUSION

Adaptogenic herbs play important role in improving skin and hair health by providing natural protection against damage caused by stress .it is important in anti aging and protective cosmetic formulation because of their anti oxidant anti inflammatory and cellualar repair property.

Adaptogenic herbs like Panax ginseng, Ashwagandha, Rhodiola, Schisandra and Notoginseng are great for skincare and hair care products. Incarcopration of these adaptogenic herb in formulations helps maintaining skin elasticity, hydration, and barrier function, even for hairs the improve hair growth, scalp health, and follicle strength.

Overall adaptogenic herbs are a natural way to take care of your skin and hair. They help with stress from the outside and from the inside. Adaptogenic herbs are a choice for people who want to take care of their skin and hair in a healthy way. We should do research on adaptogenic herbs to learn more, about how they work and how we can use them best in skincare and hair care products. This research should look at how much of the ingredients we need how to make the best products and we need to do big studies to see if they really work.

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