



Review Article

A Role Of "Ridge Gourd" To Promoting Hair Growth

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Ridge gourd (*Luffa acutangula*) has gained scientific and traditional interest for its potential benefits in supporting healthy hair growth. Rich in essential nutrients such as vitamins, minerals, and antioxidants, ridge gourd is believed to help strengthen hair follicles, improve scalp circulation, and reduce hair damage caused by oxidative stress. Extracts from ridge gourd have also been reported to support melanin restoration, which may help delay premature graying. Its natural enzymes and moisturizing properties contribute to reduced hair breakage and enhanced shine. This review highlights the bioactive components of ridge gourd and their potential mechanisms in promoting hair growth, based on available herbal and ethnobotanical evidence. Further clinical studies are needed to confirm its efficacy and optimize its use in modern hair-care formulations.

Keywords: Ridge gourd; *Luffa acutangula*; hair growth; herbal remedy; antioxidants; scalp health; melanin restoration; natural hair care.

INTRODUCTION

Ridge gourd (*Luffa acutangula*) is a widely used vegetable in traditional Asian medicine and has recently gained attention for its potential role in promoting healthy hair growth. Hair loss and thinning are common concerns influenced by genetics, environmental stress, nutritional deficiencies, and chemical hair treatments. As interest grows in natural and plant-based solutions, ridge gourd has become notable for its rich nutrient profile, which includes vitamins, minerals, enzymes, and antioxidant compounds that support scalp and follicle health. Traditionally, the dried or processed extract of ridge gourd has been used to enhance hair strength, restore natural pigmentation, and reduce premature graying. Its natural bioactive components are believed to improve blood circulation in the scalp, reduce oxidative damage, and nourish hair follicles—factors that contribute to stronger, healthier hair. Despite its long history of use, scientific exploration of ridge gourd's therapeutic properties is still evolving, making it an important area for further research in herbal cosmetology and hair-care product development. [1] Hair health is an important aspect of

personal well-being, influencing appearance, confidence, and cultural identity. However, increasing exposure to environmental pollutants, stressful lifestyles, poor dietary habits, and frequent use of harsh chemical treatments has led to a rise in hair-related problems such as thinning, breakage, hair loss, and premature graying. These challenges have encouraged researchers and consumers to explore natural, plant-based alternatives that provide safer, long-term benefits for scalp and follicular health. Among the many herbal resources studied, ridge gourd (*Luffa acutangula*), a commonly consumed vegetable in various tropical regions, has emerged as a promising ingredient in traditional and modern hair-care practices. Ridge gourd is valued not only for its nutritional properties but also for its therapeutic potential, particularly in Ayurveda and other herbal medicinal systems. The fruit contains bioactive compounds such as carotenoids, flavonoids, saponins, essential vitamins, and natural enzymes, all of which may contribute to healthier hair growth. Traditionally, the dried fibrous portion or extract of ridge gourd has been infused into oils to rejuvenate dull or damaged hair. It is believed to support melanin production, reduce premature graying, strengthen hair shafts, and

enhance natural shine. These benefits are often attributed to its antioxidant activity, scalp-nourishing properties, and ability to improve microcirculation around hair follicles. [2] Scientifically, interest in ridge gourd is growing due to the increasing demand for effective herbal treatments with fewer side effects compared to synthetic formulations. Preliminary studies have suggested that the antioxidant and anti-inflammatory characteristics of ridge gourd extracts may help reduce oxidative stress—one of the major factors responsible for hair weakening and follicular degeneration. Despite these promising indications, comprehensive scientific evidence on its mechanisms, effectiveness, and optimal application methods remains limited. Therefore, exploring the role of ridge gourd in promoting hair growth is essential for developing evidence-based herbal solutions and expanding the scope of natural cosmetology.

Definition

Ridge gourd (*Luffa acutangula*) is a tropical vine vegetable belonging to the Cucurbitaceae family, known for its fibrous interior and high nutrient content. In the context of hair care, ridge gourd refers to the fresh fruit, dried fibers, or extracted compounds used in traditional and herbal formulations to support hair growth and scalp health. It is defined as a natural plant-based ingredient rich in vitamins, minerals, antioxidants, and enzymes believed to nourish hair follicles, reduce oxidative stress, improve scalp circulation, and promote stronger, healthier hair. Ridge gourd oil or extract is commonly applied topically to restore hair vitality, enhance shine, and potentially delay premature graying.

Phytochemical Profile Relevant to Hair Growth

Ridge gourd (*Luffa acutangula*) contains a rich spectrum of phytochemicals that contribute to its potential as a natural hair-growth-promoting agent. These bioactive compounds support follicular strength, scalp nourishment, and protection against oxidative damage—factors essential for healthy hair development.

1. Flavonoids

Flavonoids such as quercetin and luteolin are powerful antioxidants found in ridge gourd. They help

neutralize free radicals on the scalp, reducing oxidative stress that can weaken hair follicles and contribute to hair thinning. Their anti-inflammatory properties may also soothe the scalp and promote an environment supportive of hair growth. [3]

2. Saponins

Saponins possess mild cleansing and antimicrobial activities. Their natural surfactant properties help remove excess sebum, dirt, and buildup that can block hair follicles. By maintaining a cleaner scalp environment, saponins indirectly support stronger follicular activity and healthier hair roots.

3. Carotenoids

Carotenoids such as β -carotene contribute to cell repair and scalp nourishment. These compounds can be converted into vitamin A, a nutrient essential for regulating sebum production and maintaining the integrity of skin cells on the scalp. Adequate vitamin A levels support optimal follicle function and prevent dryness-related hair breakage. [5]

4. Phenolic Compounds

Phenolic acids present in ridge gourd contribute additional antioxidant benefits. They help protect scalp tissues from environmental stressors and UV-induced oxidative damage. This protection may reduce follicle aging and support long-term hair vitality.

5. Vitamins (A, C, and B-complex)

Ridge gourd naturally contains vitamins associated with hair health.

- **Vitamin C** boosts collagen synthesis and enhances iron absorption, both essential for strong hair shafts.
- **Vitamin A** aids Sebum balance, supporting a moisturized, healthy scalp.
- **B-complex vitamins** help support cellular energy production in hair follicles, encouraging active growth. [7]

6. Minerals (Zinc, Iron, Manganese)

The mineral content of ridge gourd contributes to structural and metabolic processes within the follicles.

- **Zinc** supports keratin formation and helps regulate oil glands.
- **Iron** enhances oxygen delivery to follicles, critical for growth cycles.
- **Manganese** aids antioxidant enzyme activity, protecting follicles from damage.

7. Natural Enzymes

Enzymes in ridge gourd help break down residues on the scalp and support nutrient absorption in follicular tissues. These enzymes may also improve the effectiveness of ridge gourd oil or extract when applied topically.

Antioxidant and Anti-inflammatory Activity

Ridge gourd (*Luffa acutangula*) exhibits significant antioxidant and anti-inflammatory properties that play a vital role in maintaining scalp health and supporting hair growth. Hair follicles are highly sensitive to oxidative stress and inflammatory processes, which can weaken their structure, disturb the hair growth cycle, and lead to conditions such as thinning, breakage, and hair fall. The phytochemicals in ridge gourd help counteract these damaging effects. [11]

1. Antioxidant Properties

Ridge gourd contains diverse antioxidant compounds, including flavonoids, carotenoids, and phenolic acids. These molecules help neutralize reactive oxygen species (ROS) produced by pollution, UV exposure, and metabolic processes on the scalp. Reduced oxidative stress protects the hair follicles from premature aging and structural damage.

- **Flavonoids** (e.g., quercetin, luteolin) act as strong free-radical scavengers, preserving follicular cells.
- **Carotenoids** contribute to protecting scalp tissues from UV-induced oxidative damage.

- **Vitamin C**, naturally present in ridge gourd, enhances collagen synthesis, which strengthens the hair shaft and improves follicular resilience.

By reducing oxidative load, ridge gourd helps maintain a healthy hair growth environment and supports longer, stronger hair strands. [13]

2. Anti-inflammatory Effects

Inflammation of the scalp—often triggered by dandruff, microbial imbalance, chemical irritants, or autoimmune reactions—can disrupt the hair growth cycle by damaging follicular tissues. Ridge gourd's bioactive compounds possess natural anti-inflammatory actions that help calm irritated scalp conditions.

- **Phenolic compounds** reduce inflammatory mediators that contribute to scalp redness, itching, and follicle sensitivity.
- **Saponins** offer mild antimicrobial and soothing effects, helping to manage conditions that may trigger inflammatory responses.
- The presence of **zinc** further supports anti-inflammatory activity by aiding tissue repair and regulating sebum, preventing scalp irritation.

By minimizing inflammation, ridge gourd helps maintain the health of hair follicles, promotes proper nutrient flow, and ensures smoother progression through the hair growth cycle.

3. Overall Impact on Hair Growth

The combined antioxidant and anti-inflammatory actions of ridge gourd create a protective environment that prevents follicle degeneration and enhances scalp health. This holistic protection supports sustained hair growth, reduces breakage, and may slow age-related changes such as premature graying.

Enhancement of Melanocyte Function

Hair pigmentation is primarily determined by melanocytes—specialized cells located in the hair follicle bulb that produce melanin. The activity and health of melanocytes are critical for maintaining natural hair color and preventing premature graying.

Ridge gourd (*Luffa acutangula*) has been traditionally associated with promoting hair pigmentation, and emerging evidence suggests that its bioactive components may positively influence melanocyte function. [17]

1. Role of Antioxidants in Melanocyte Health

Oxidative stress is a major factor that disrupts melanocyte activity, leading to decreased melanin production and premature graying. Ridge gourd is rich in antioxidants, including flavonoids, carotenoids, and vitamin C, which help neutralize reactive oxygen species (ROS) in the scalp environment. By reducing oxidative damage, ridge gourd protects melanocytes, supporting sustained melanin synthesis and healthy hair pigmentation.

2. Nutrient Support for Melanin Production

Ridge gourd contains essential vitamins and minerals such as:

- **Vitamin A**, which regulates cell differentiation and supports follicular health.
- **Copper**, a cofactor for tyrosinase, the enzyme responsible for melanin synthesis.
- **Iron and Zinc**, which enhance enzyme activity and ensure proper follicular metabolism.

These nutrients create an optimal environment for melanocyte function, potentially slowing the onset of gray hair. [19]

3. Bioactive Phytochemicals and Enzyme Regulation

Flavonoids and phenolic compounds in ridge gourd may influence enzymatic pathways involved in melanogenesis. By supporting tyrosinase activity and reducing inflammatory mediators that can damage melanocytes, ridge gourd helps maintain consistent melanin production within hair follicles.

4. Traditional Applications and Observations

In Ayurvedic and other herbal practices, ridge gourd oil or extract is used to nourish the scalp, strengthen hair, and restore natural hair color. Although scientific

studies are limited, anecdotal evidence suggests that regular topical application may enhance hair pigmentation and slow premature graying through improved melanocyte activity.

5. Overall Impact on Hair Health

By protecting melanocytes from oxidative stress, supplying essential nutrients, and supporting enzymatic pathways for melanin synthesis, ridge gourd contributes not only to stronger hair but also to natural hair coloration. This dual effect—promoting hair growth and pigmentation—makes ridge gourd a valuable botanical in herbal hair-care formulations.

Improvement of Scalp Microcirculation

Healthy blood circulation in the scalp is essential for hair growth, as it ensures the delivery of oxygen, nutrients, and bioactive compounds to the hair follicles. Ridge gourd (*Luffa acutangula*) is believed to enhance scalp microcirculation, which supports follicular activity and overall hair vitality. [23]

1. Nutrient-mediated Vascular Support

Ridge gourd is rich in vitamins (particularly A, C, and B-complex) and minerals such as iron and zinc, which contribute to healthy blood vessel function.

- **Vitamin C** strengthens capillary walls and supports collagen formation, improving the structural integrity of scalp vessels.
- **Iron** enhances hemoglobin levels, improving oxygen transport to the follicles.
- **Zinc** aids in tissue repair and enzyme function within vascular tissues.

Improved nutrient availability supports optimal follicle function, which is critical for active hair growth.

2. Vasodilatory Effects of Bioactive Compounds

Certain flavonoids and saponins in ridge gourd may exert mild vasodilatory effects, enhancing blood flow in the scalp. Enhanced circulation ensures that hair follicles receive sufficient oxygen and nutrients,

which helps prolong the anagen (growth) phase of the hair cycle. [25]

3. Reduction of Scalp Inflammation and Stagnation

Inflammation or oxidative stress in the scalp can compromise blood flow and damage follicles. Ridge gourd's antioxidant and anti-inflammatory properties help maintain a clean and healthy scalp environment, reducing follicular congestion and promoting efficient microcirculation.

4. Overall Impact on Hair Growth

By improving microcirculation, ridge gourd ensures that hair follicles are well-nourished and oxygenated, which enhances cell proliferation, strengthens the hair shaft, and supports robust hair growth. This vascular support, combined with its antioxidant, anti-inflammatory, and melanocyte-enhancing properties, makes ridge gourd a comprehensive natural agent for hair and scalp health. [24]

Strengthening of Hair Follicles

Hair follicles are dynamic structures that anchor hair shafts and regulate the hair growth cycle. The strength and health of follicles are crucial for preventing hair breakage, thinning, and premature shedding. Ridge gourd (*Luffa acutangula*) contains bioactive compounds and nutrients that contribute to follicular reinforcement and resilience.

1. Nutritional Support for Follicle Structure

Ridge gourd is rich in vitamins (A, C, B-complex), minerals (zinc, iron, manganese), and amino acids that support keratin synthesis—the primary structural protein of hair.

- **Vitamin A** regulates sebum production, maintaining follicle lubrication and preventing dryness.
- **Vitamin C** enhances collagen production, which strengthens the connective tissue around follicles.
- **Zinc and Iron** support enzymatic activities necessary for healthy follicular metabolism.

Adequate nutrition from ridge gourd ensures follicles remain robust and capable of producing thick, strong hair shafts.

2. Antioxidant Protection of Follicles

Oxidative stress damages follicular cells, leading to weakening, miniaturization, and hair loss. Ridge gourd's flavonoids, carotenoids, and phenolic compounds neutralize reactive oxygen species (ROS), protecting follicles from premature aging and functional decline. [22]

3. Anti-inflammatory Support

Inflammation of the scalp can damage hair follicles, disrupt the hair cycle, and promote shedding. Ridge gourd's anti-inflammatory phytochemicals reduce follicular irritation and support a healthier microenvironment for sustained hair growth.

4. Hydration and Moisturization

Ridge gourd contains natural enzymes and water-retaining compounds that help maintain scalp moisture. A well-hydrated follicle is less prone to brittleness and breakage, supporting overall hair strength.

5. Synergistic Effect with Scalp Circulation and Melanocyte Support

By enhancing microcirculation and supporting melanocyte function, ridge gourd indirectly strengthens follicles. Improved nutrient delivery, oxygenation, and protection from oxidative damage collectively reinforce follicular integrity and prolong the anagen (growth) phase of hair. [21]

6. Overall Impact on Hair Health

Through nutritional, antioxidant, anti-inflammatory, and moisturizing mechanisms, ridge gourd contributes to stronger, healthier hair follicles. Regular application or dietary inclusion can reduce hair fragility, minimize hair loss, and support thicker, shinier, and more resilient hair.

Antimicrobial and Anti-dandruff Potential

Scalp health plays a critical role in maintaining hair growth and quality. Microbial overgrowth, including bacteria and fungi, can lead to dandruff, inflammation, and follicular damage, ultimately contributing to hair thinning and loss. Ridge gourd (*Luffa acutangula*) contains bioactive compounds that exhibit antimicrobial and anti-dandruff properties, making it a beneficial ingredient for scalp care.

1. Antimicrobial Activity

Ridge gourd is rich in saponins, flavonoids, and phenolic compounds with natural antimicrobial properties. These phytochemicals inhibit the growth of common scalp pathogens such as *Malassezia* species, *Staphylococcus aureus*, and other bacteria or fungi responsible for scalp infections. By controlling microbial colonization, ridge gourd helps maintain a balanced scalp microbiome, reducing irritation and follicular damage. [20]

2. Anti-dandruff Effect

Dandruff is primarily caused by fungal overgrowth, sebum accumulation, and scalp inflammation. Ridge gourd's saponins and antioxidant compounds help cleanse the scalp by removing excess oils and debris while providing antimicrobial protection. Additionally, its anti-inflammatory properties reduce redness, itching, and irritation commonly associated with dandruff, supporting a healthier scalp environment conducive to hair growth.

3. Soothing and Protective Action

The moisturizing and enzymatic components of ridge gourd contribute to scalp hydration, reducing dryness and flaking. A well-hydrated and balanced scalp prevents mechanical damage to hair follicles, reducing breakage and improving hair texture.

4. Overall Impact on Hair Growth

By controlling microbial overgrowth, alleviating dandruff, and maintaining scalp health, ridge gourd indirectly supports hair follicle function and promotes stronger, healthier hair. Its combined antimicrobial, anti-inflammatory, and moisturizing properties make it a natural, multi-functional agent for maintaining scalp hygiene and optimizing hair growth. [18]

Moisturizing and Conditioning Effects

Healthy hair requires adequate moisture and proper conditioning to maintain flexibility, shine, and resistance to breakage. Ridge gourd (*Luffa acutangula*) exhibits natural moisturizing and conditioning properties, making it a valuable ingredient for hair care formulations.

1. Hydrating Bioactive Compounds

Ridge gourd contains natural polysaccharides, mucilage, and water-retaining enzymes that help retain moisture in the hair shaft and scalp. These compounds form a protective layer over hair fibers, preventing dehydration and reducing hair brittleness.

2. Conditioning Effect on Hair Shaft

The application of ridge gourd extract or oil can smooth the cuticle layer of hair, minimizing roughness and tangling. By enhancing hair texture and softness, ridge gourd improves manageability and reduces mechanical damage during combing or styling. [16]

3. Scalp Hydration and Follicle Support

Moisturizing the scalp is essential for maintaining healthy follicles and supporting hair growth. Ridge gourd helps maintain an optimal moisture balance on the scalp, preventing dryness-induced irritation and flaking. A well-hydrated scalp ensures follicles remain flexible and nutrient-absorbing, which promotes sustained hair growth.

4. Synergistic Benefits with Antioxidant and Anti-inflammatory Properties

The moisturizing effect of ridge gourd works synergistically with its antioxidant and anti-inflammatory activities. While bioactive compounds protect hair follicles and melanocytes, hydration enhances nutrient absorption and maintains follicular integrity, contributing to stronger, healthier hair.

5. Overall Impact on Hair Health

Through hydration, cuticle smoothing, and scalp conditioning, ridge gourd prevents hair breakage, reduces frizz, and enhances shine. Its natural

moisturizing and conditioning effects complement its other benefits—antioxidant, anti-inflammatory, and antimicrobial properties—making it a holistic natural agent for improving hair quality and supporting growth. [15]

Synergistic Potential in Herbal Formulations

Ridge gourd (*Luffa acutangula*) demonstrates significant potential as a component in multi-herbal hair-care formulations. Its diverse bioactive profile—comprising antioxidants, vitamins, minerals, flavonoids, saponins, and natural enzymes—allows it to work synergistically with other botanical ingredients to enhance hair growth, scalp health, and hair quality.

1. Complementary Antioxidant Activity

When combined with other antioxidant-rich herbs, such as amla (*Phyllanthus emblica*) or bhringraj (*Eclipta alba*), ridge gourd can amplify the protective effect against oxidative stress in hair follicles. This synergism helps reduce follicular damage, delay premature graying, and maintain hair shaft integrity. [14]

2. Enhanced Anti-inflammatory and Anti-dandruff Effects

Herbs like neem (*Azadirachta indica*) or tea tree (*Melaleuca alternifolia*) are well-known for antimicrobial and anti-inflammatory properties. Incorporating ridge gourd with these botanicals can enhance scalp health by reducing irritation, controlling dandruff, and creating a balanced environment for hair growth.

3. Improved Follicle Nutrition and Circulation

Ridge gourd's minerals and vitamins can complement nutrient-rich oils or extracts from herbs such as fenugreek (*Trigonella foenum-graecum*) and aloe vera (*Aloe barbadensis*). This combination ensures optimal delivery of nutrients, improved microcirculation, and sustained follicular activity.

4. Conditioning and Moisturizing Synergy

Ridge gourd's hydrating polysaccharides and mucilage work synergistically with natural oils like

coconut, argan, or castor oil to provide deep conditioning. This combination improves hair elasticity, reduces breakage, and enhances smoothness and shine.

5. Formulation Advantages

The inclusion of ridge gourd in herbal blends provides a multifunctional approach: antioxidant protection, anti-inflammatory and antimicrobial support, follicle nourishment, melanocyte enhancement, and conditioning—all in one formulation. Such synergistic effects make ridge gourd an effective adjunct in both topical oils and hair-care products designed for growth, strength, and scalp health. [12]

6. Overall Impact

By combining ridge gourd with complementary herbal ingredients, formulations can deliver enhanced, multi-targeted benefits. This synergy ensures a holistic approach to hair care, addressing structural, nutritional, and protective aspects simultaneously, which supports stronger, healthier, and more vibrant hair.

Rich Nutrient and Phytochemical Content

Ridge gourd (*Luffa acutangula*) is a nutrient-dense vegetable that contains a wide array of vitamins, minerals, and bioactive phytochemicals, making it highly beneficial for hair health. Its combination of essential nutrients and plant compounds supports follicle nourishment, scalp health, and hair growth. [9]

1. Vitamins

Ridge gourd is rich in vitamins critical for hair growth:

- **Vitamin A** regulates sebum production and supports follicle integrity.
- **Vitamin C** promotes collagen synthesis and enhances antioxidant defense in scalp tissues.
- **B-complex vitamins** (B1, B2, B3, B5, B6) support energy metabolism in hair follicles and keratin synthesis.

2. Minerals

Minerals in ridge gourd are essential for enzymatic reactions and structural support of hair:

- **Zinc** promotes keratin formation and regulates oil production.
- **Iron** ensures oxygen transport to follicles, enhancing growth.
- **Manganese** contributes to antioxidant enzyme function, protecting follicles from oxidative stress.

3. Flavonoids and Phenolic Compounds

These compounds act as antioxidants and anti-inflammatory agents, protecting hair follicles from free radical damage and reducing scalp irritation. Quercetin and luteolin are notable flavonoids present in ridge gourd that help maintain follicular health.

4. Saponins and Polysaccharides

Saponins offer mild cleansing and antimicrobial activity, supporting scalp hygiene. Polysaccharides and mucilage in ridge gourd retain moisture in the scalp and hair shaft, improving hydration and hair manageability. [8]

5. Carotenoids and Enzymes

Carotenoids, such as beta-carotene, contribute to melanin production and overall follicle nourishment. Natural enzymes in ridge gourd support nutrient absorption and maintain scalp health by gently exfoliating and cleansing the scalp.

6. Overall Impact on Hair Health

The rich nutrient and phytochemical content of ridge gourd provides a multi-dimensional approach to hair care. It nourishes follicles, strengthens hair shafts, enhances pigmentation, protects against oxidative stress, reduces inflammation, and maintains scalp health. These combined effects make ridge gourd a valuable botanical in both dietary and topical applications for promoting healthy hair growth.

Mechanism of Action of Ridge Gourd in Hair Growth

Ridge gourd (*Luffa acutangula*) promotes hair growth through multiple biological pathways that collectively support follicular strength, scalp health, and hair pigmentation. Its diverse phytochemicals, vitamins, minerals, and natural enzymes interact synergistically to influence key physiological processes essential for healthy hair development. [8]

1. Antioxidant Defense Against Follicular Damage

Reactive oxygen species (ROS) weaken hair follicles, accelerate aging, and disrupt the hair growth cycle. Ridge gourd is rich in flavonoids, carotenoids, phenolic acids, and vitamin C, all of which neutralize ROS.

- This antioxidant activity protects follicular cells from oxidative stress.
- It slows follicle miniaturization and supports a prolonged anagen (growth) phase.

2. Anti-inflammatory Regulation of Scalp Environment

Chronic scalp inflammation can impair follicle function and trigger hair loss. Ridge gourd's phenolic compounds and saponins reduce inflammatory mediators and soothe irritation.

- This creates a stable environment for hair growth.
- It prevents damage to follicular tissues caused by inflammation-related disorders, such as dandruff or dermatitis.

3. Enhancement of Scalp Microcirculation

Improved blood flow ensures optimal delivery of oxygen and nutrients to hair follicles. Ridge gourd's nutrients—especially vitamin C, iron, and B-complex vitamins—support vascular health and enhance microcirculation.

- Better circulation stimulates follicular activity and hair shaft production.
- It supports the transition of dormant follicles into the active growth phase.

4. Nutrient Supply for Follicular Metabolism and Keratin Synthesis

Hair follicles require a continuous supply of nutrients for keratin production and cellular energy. Ridge gourd provides essential vitamins (A, B, C) and minerals (zinc, iron, manganese) that: [6]

- Promote keratin formation for stronger hair fibers.
- Enhance energy metabolism within follicular cells.
- Improve follicle resilience against environmental and chemical stressors.

5. Support of Melanocyte Function and Hair Pigmentation

Melanocytes determine hair color by producing melanin. Ridge gourd helps protect these cells through:

- Antioxidants that reduce melanocyte damage.
- Nutrients like copper and beta-carotene that support melanin synthesis.

As a result, ridge gourd may help maintain natural pigmentation and delay premature graying.

6. Antimicrobial Protection for Scalp Hygiene

Scalp infections and dandruff—often caused by fungi like *Malassezia*—can disrupt follicle health. Ridge gourd's saponins and flavonoids provide natural antimicrobial effects that: [4]

- Reduce harmful microbial growth.
- Maintain a balanced scalp microbiome.
- Prevent dandruff-associated follicle irritation.

7. Moisturizing and Conditioning Effects

Ridge gourd contains mucilage, polysaccharides, and enzymes that hydrate the scalp and hair shaft.

- These compounds maintain moisture balance.
- They protect hair fibers from dryness, breakage, and frizz.

Healthy hydration enhances overall hair strength and appearance.

8. Synergistic Action in Multi-Herbal Formulas

Ridge gourd works synergistically with herbs such as amla, neem, bhringraj, fenugreek, and aloe vera.

- Its phytochemicals complement the antioxidant, antimicrobial, and conditioning actions of these herbs.
- This multi-targeted synergy enhances overall hair-growth potential. [11]

SUMMARY

Ridge gourd (*Luffa acutangula*) is a nutrient-rich vegetable with significant potential in promoting hair growth and improving scalp health. Its bioactive components—including flavonoids, carotenoids, vitamins, minerals, saponins, and natural enzymes—provide multiple benefits essential for strong and healthy hair. Ridge gourd supports hair growth through several mechanisms: protecting follicles from oxidative stress, reducing scalp inflammation, enhancing microcirculation, strengthening follicular structures, and supporting melanocyte activity to help maintain natural pigmentation. Additionally, its antimicrobial and anti-dandruff properties contribute to a cleaner, healthier scalp environment, while its moisturizing and conditioning effects improve hair texture, reduce breakage, and enhance shine. Ridge gourd also demonstrates strong synergistic potential when combined with other herbal ingredients, making it an effective component in traditional and modern hair-care formulations. Overall, ridge gourd offers a holistic, natural approach to improving hair growth and scalp health, though further scientific research is needed to fully validate its therapeutic efficacy and optimize its use in hair-care products.

CONCLUSION

Ridge gourd (*Luffa acutangula*) demonstrates significant potential as a natural, multi-functional agent for promoting healthy hair growth and maintaining scalp vitality. Its rich composition of vitamins, minerals, flavonoids, saponins, carotenoids, and natural enzymes contributes to a comprehensive range of biological activities that support hair health. The antioxidant and anti-inflammatory properties protect follicles from oxidative stress and irritation, while its antimicrobial effects help maintain a clean

and balanced scalp environment. Additionally, ridge gourd enhances microcirculation, strengthens hair follicles, and supports melanocyte function, which collectively promote stronger hair growth and help preserve natural hair pigmentation. The vegetable's moisturizing and conditioning capabilities further improve hair texture, reduce breakage, and enhance overall hair quality. When incorporated into herbal formulations, ridge gourd works synergistically with other botanicals to deliver amplified benefits, making it a valuable component in both traditional and modern hair-care systems.

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