



## “A COMPREHENSIVE REVIEW OF BOTANICAL INGREDIENTS LIKE PUMPKIN SEEDS, BLACK CUMIN SEEDS AND BURDOCK ROOTS AND THEIR EFFICACY FOR HEALTHY HAIR AND PREVENTING PREMATURE GRAYING OF HAIRS.”

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### Abstract

Hair health and the prevention of premature graying have been enduring concerns for individuals seeking natural and effective remedies. Hair is a crucial aspect of an individual's appearance, enhancing their personality, glamour, self-esteem, and confidence. It is a protein filament that grows from dermal follicles and is derived from the skin's ectoderm. Hair growth and pigmentation are biological activities of hair follicles, and it is essential to care for both the hair follicle and the hair shaft for healthy, manageable hair. Micronutrients, such as vitamins and minerals, play essential roles in maintaining hair health and growth. Hair follicles undergo four stages: anagen (growth stage), catagen (degenerative phase), telogen (resting stage), and exogen (shedding stage). Pumpkin seeds, known for their rich nutrient profile, contain vitamins, minerals, and antioxidants that are crucial for hair health. Their potential to strengthen hair follicles, improve hair texture, and reduce hair loss will be explored in this review. Black cumin seeds, a source of essential fatty acids, vitamins, and minerals, have gained attention for their purported ability to combat hair loss, promote hair growth, and maintain natural hair color. Burdock roots, traditionally used for their detoxifying properties, are also recognized for their role in nourishing the scalp and supporting overall hair health.

**Keywords:** Hair Health, Pumpkin seeds, Black cumin seeds and Burdock roots.

### 1. INTRODUCTION

One of the most crucial and conspicuous elements that enhances a person's overall image is their hair. It establishes the tone for an individual's overall appearance and boosts their personality, glamour, self-esteem, and confidence<sup>[46]</sup>. Hair is a protein filament that grows from dermal follicles<sup>[54]</sup>. It is a vital part of our body that is derived from the ectoderm of the skin. It serves as a protective appendage for the body and is regarded as an accessory structure of the body with an integument-like structure, along with the sebaceous gland and sweat gland<sup>[45]</sup>.

Hair growth and pigmentation are biological activities of hair follicles. The hair shaft is primarily composed of protein and is considered to be dead. It is important to care for both the hair follicle and the hair shaft for healthy, manageable hair<sup>[45]</sup>.

## 1.1 STRUCTURE OF HAIR

A filament known as hair is primarily made up of keratinized, dead cells [34]. Hair is typically divided into two sections: the root and the shaft. However, considering the skin of hairs, it plays an important role in the nourishment of hair. Hairs are extended deeper into the skin layer, where the sebaceous gland aids in the nourishment of hairs and follicles [47]. The bulb and peribulbar are located in the lower part of the hair root, as are the infundibulum and isthmus. The hair bulb is formed by the dermal papilla, which is made up of specialised fibroblasts, blood arteries, and nerve endings, and the hair matrix, which is made up of rapidly reproducing keratinocytes. The subcutis is where hair follicles on the scalp are anchored and go through growth cycles. The three layers that make up the hair shaft are the cuticle, cortex, and medulla. The medulla is the furthest part of the hair visible on the skin. It is surrounded by the root sheath, which is a protective layer [34].

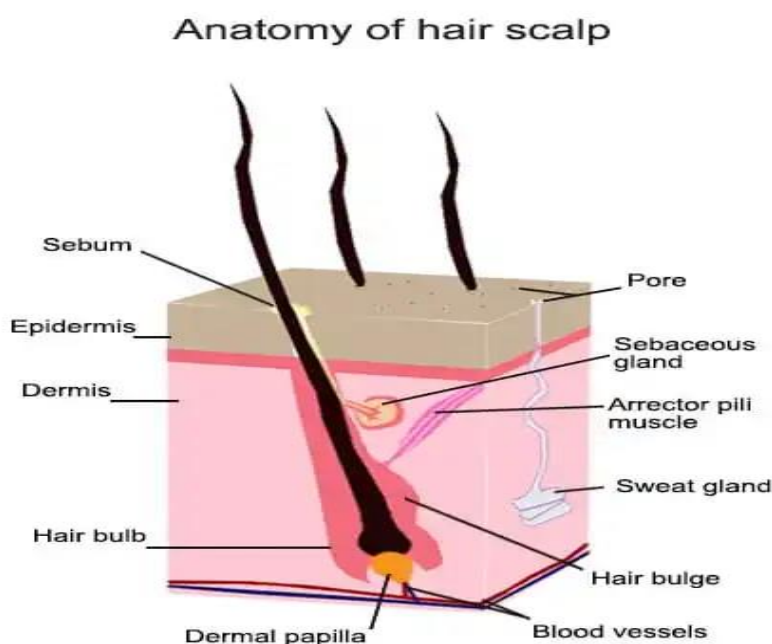


FIGURE 1: ANATOMY OH HAIR SCALP

## 1.2 HAIR GROWTH CYCLE

Hair is the cumulative, physical result of a coordinated process of cellular proliferation and differentiation within a hair follicle [49]. Hair follicles are epidermally derived appendages formed by inductive events involving specialised dermal fibroblasts acting on bipotential epithelial stem cells. When stem cells commit to the fate of a hair follicle, they go through a period of massive proliferation, culminating in the formation of a mature hair follicle [20]. The complex process of the hair follicle cycle includes cell differentiation, interactions between epithelial and mesenchymal cells, stem cell augmentation, pattern formation, apoptosis (programmed cell death), the growth cycles of cells and organs, and pigmentation [49].

The most important reason for studying the cycling of the hair follicle is that the follicle is a regenerating system [49]. The follicle exhibits the rare ability to fully rejuvenate itself by moving through the stages of the cycle (growth, regression, resting, shedding, then growth again [24].

Normally hair follicles go through four different stages: Anagen (a growth stage), catagen (a degenerative phase), telogen (a resting stage), exogen (a shedding stage) [55]. The anagen stage of scalp hairs lasts between two and five years, the catagen stage lasts between a few days and a few weeks, and the telogen stage lasts roughly three months [33].

STAGE	KEY FEATURES
Anagen	Active growth phase Early anagen: hair matrix forms new hair Nourishment of HF from blood supply enables hair growth Lasts 2–6 years
Catagen	Intermediate or “transition” phase Deeper portion of the HF starts to collapse, HF detaches from nourishing blood supply Lasts 1–2 weeks
Telogen	Resting phase Remains of the hair bulk are inactive, papillary cells completely separate from HF Lasts 5–6 weeks
Exogen	Shedding phase Hairs at the end of their life fall out Mainly coupled to early anagen but also occurs in telogen

**TABLE 1: THE MAIN PHASES OF HAIR GROWTH CYCLE** [22]

## ANAGEN

The beginning of the anagen stage recapitulates the development of hair follicles. As secondary germ cells proliferate in the bulge to form new lower hair follicles [37].

Anagen can be divided into six stages. During early stage, proliferating cells of the hair follicles begin to differentiate into the hair shaft and inner root sheath, encircle the developing dermal papilla, grow downward into the skin, and proliferate. In mid anagen, the newly formed hair shaft starts to develop as melanocytes in the hair matrix begin to produce pigments. In late anagen, the formation of epithelial hair bulb surrounding the dermal papilla, which is deep within the subcutaneous tissue, and the new hair shaft emerging from the skin’s surface indicate complete restoration of the hair fiber-producing unit [33]. Active signal exchange takes place between the fibroblasts of the dermal papilla and the epithelial cells of the hair bulb during anagen [40]. The anagen growth phase of human scalp hairs can last between 2 and 8 years [22].

The anagen period ends with a highly controlled involution of the hair follicle resulting in apoptosis and terminal differentiation [24].

## CATAGEN

Catagen, the next stage of hair follicle involution, comes after anagen. Kligman and Straile provided the first detailed descriptions of catagen. At the start of catagen, melanocytes stop producing pigment, hair shaft proliferation and differentiation of hair matrix keratinocytes decrease significantly [40].

Catagen is divided into eight sub-stages morphologically and functionally. Club hair is created during catagen, a specialized structure. The club hair is anchored in the telogen follicle by a keratinized brush-like structure at the base that is surrounded by epithelial cells from the outer root sheath [33]. Hair follicles undergo a highly controlled process of involution during this stage, the majority of which is characterized by a burst of programmed cell death (apoptosis) in follicular keratinocytes. Follicular melanogenesis also ceases during this stage, and some follicular melanocyte undergo apoptosis as well [27].

The dermal papilla condenses and rises towards the end of the catagen stage, resting beneath the bulge of the Hair follicle. The follicle stops cycling and the hair falls out if the dermal papilla fails to reach the bulge in the catagen stage [37]

## TELOGEN

Following catagen, telogen is the resting stage of the hair follicle cycle and is characterized by hair shedding or loss [22].

The hair shaft develops into a club hair during the telogen stage and eventually falls out of the follicle, typically when combed or washed [37]. Shortly after birth, human follicle cycles in human show desynchronization. Furthermore, the duration of telogen lengthens as a person develops; older animals and humans have a slower HF turnover rate [48].

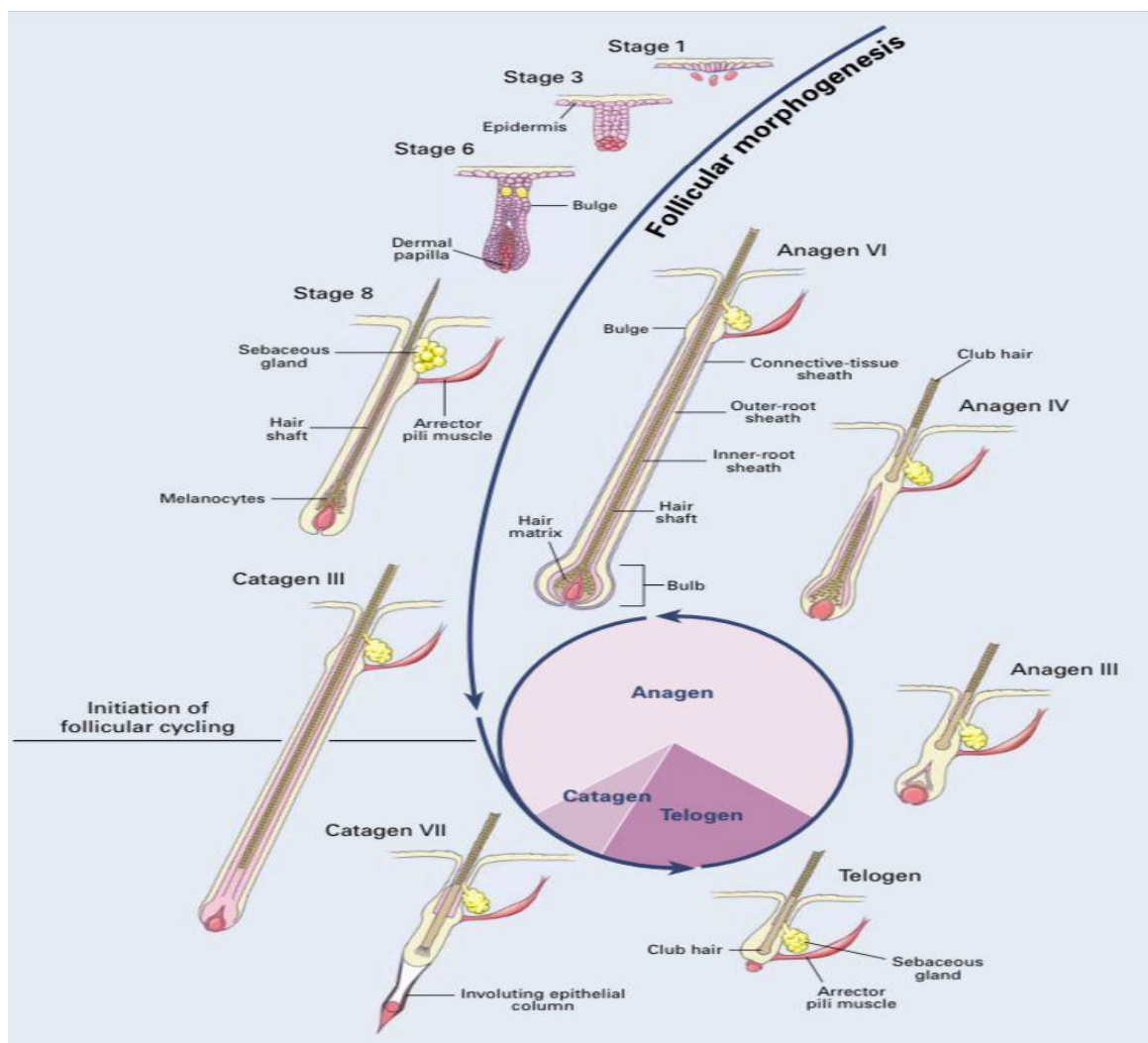
The average person loses 50 to 150 scalp hair each day. Before the scalp follicles reenter the anagen stage and the cycle is repeated, the telogen stage typically lasts for two to three months [37].

## EXOGEN:

Exogen is newly recognized phase of the hair cycle that involves active hair shaft shedding from the telogen follicle along with the activation of proteolytic processes in the follicular root [30].

Exogen hairs are passively retained within the follicles, in contrast to anagen and telogen, hairs which are strongly anchored to the follicle. Exogen clubs also do not retain any of the outer sheath, in contrast to telogen hairs that have been plucked [40].

different rates of the cycle progression are observed in human hair follicle. Human hair follicles typically cycle every 2 to 8 years, meaning that at any given time, 86% of hairs are in the anagen stage, 1% are in the catagen stage, and the remaining 13% are in the telogen stage [22]



**FIGURE 2: STAGES OF HAIR GROWTH CYCLE**

### 1.3 ROLE OF MICRONUTRIENTS IN HAIR LOSS

**Micronutrients:** These are the nutrients that our body require in smaller amount but are equally important for overall health. They don't provide energy directly, but play essential roles in various physiological processes [51]

Micronutrients are often divided into

- VITAMINS and
- MINERALS

VITAMINS are the organic compound that are essential for various bodily functions, including the health and growth of hair. They play a crucial role in maintaining the structure, strength, and overall conditions for hair follicles as well as promoting healthy hair growth [18].

Different vitamins have specific roles in supporting hair health and growth:

Vitamin A: promotes the production of sebum, an oily substance that moisturize the scalp and helps keep hair healthy [7].

Vitamin D: Supports hair follicles cycling and may help in creating new hair follicles, which aids in hair growth [vit d for hair].

Vitamin E: Acts as an antioxidant that helps protect hair cells from damage and supports a healthy scalp [7].

Vitamin C: Supports the production of collagen, which is important for hair structure and growth [7].

Vitamin B complex: Includes several vitamins (like Biotin, B5, B6, and B12) that contribute to hair health. It Improves blood flow to scalp also decreases cholesterol accumulation to scalp and protects hair and scalp from free radical damage [49].

Vitamin K: Supports blood circulation, which is important for delivering nutrients to hair follicles.

MINERALS are the inorganic elements that are essential for various physiological process in the body. Including promoting hair health and growth. These minerals play important roles in maintain structure, strength and overall condition of hair follicles and supporting the growth of healthy hair strands.

Some of the minerals that helps in maintaining hair health and growth are:

ZINC: An essential mineral that contributes to the health of hair follicles, supports hair growth, and prevent hair thinning [16].

IRON: Important for delivering oxygen to hair follicles and promoting hair growth. Iron deficiency can lead to hair loss [7].

SELENIUM: An antioxidant mineral that supports scalp health and helps protect hair follicles from oxidative stress [16].

COPPER: Supports the production of melanin, the pigment responsible for hair color. It also plays a major role in collagen production, which contributes to hair structure.

MAGNESIUM: Promotes hair growth by aiding in the proper functioning of enzymes involved in hair follicle health.

#### 1.4 DISORDER OF HAIR

Pigmentation(fading), Dandruff, Hair loss, and Balding are the three main issue that affect hair. [35]

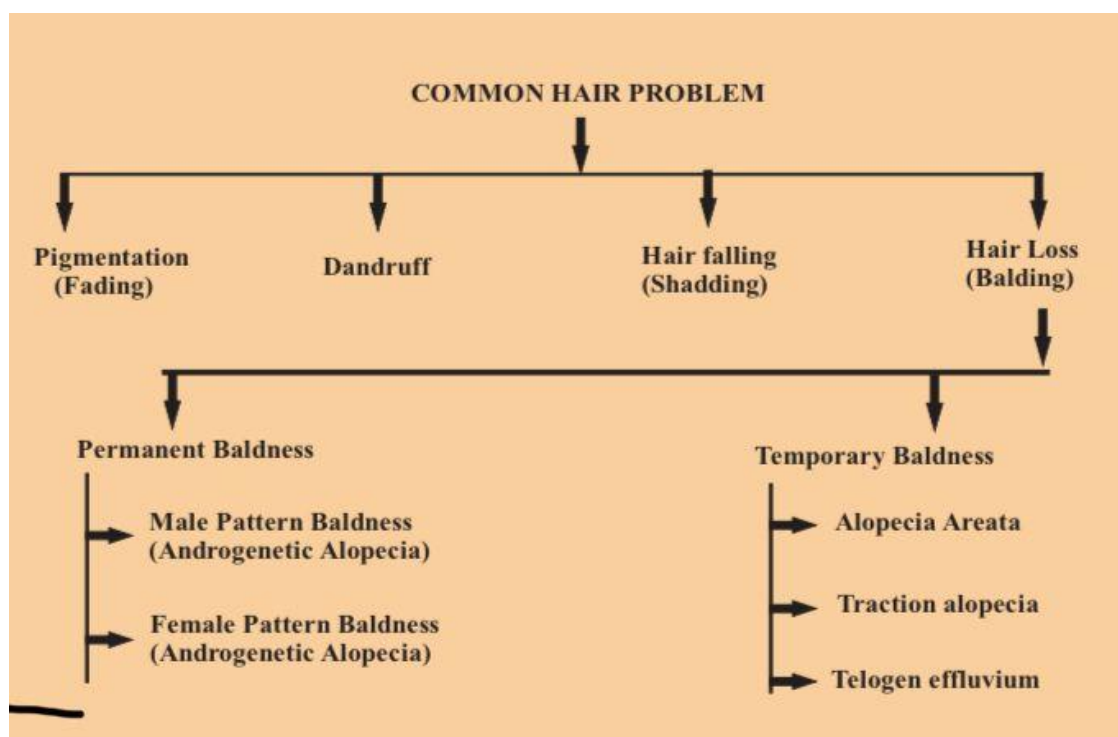


FIGURE 3: COMMON HAIR PROBLEMS

There are various disorders of hair, which causes the hair loss are Anagen effluvium, Telogen effluvium, Alopecia Areata, Traction alopecia, Androgenic Alopecia, Trichotillomania [35].

## 1.5 CAUSES OF HAIR LOSS

Causes for the hair loss are herity factor, poor nutrition, hair treatments, excessive hair style, medication (chemotherapy), hormonal changes, autoimmune diseases, vitamin deficiency, physical & emotional stress, diseases, inflammation and ageing [35].

## 2. THE ROLE OF HERBS

### 2.1 PUMPKIN SEEDS

#### 2.1.1 BOTANICAL REVIEW

##### TAXONOMICAL CLASSIFICATION (43)

This plant family is considered one of the largest families in the plant Kingdom with a large number of edible plants with 8 tribes, 118 genera, and 825 species [43]  
Taxonomic classification of *Cucurbita spp.*

Kingdom – Plantae

Division – Tracheophyta

Class – Magnoliopsida

Order – Cucurbitales

Family – Cucurbitaceae

Genus – Cucurbita

Species – *C. maxima*, *C. pepo*, *C. moschata*, *C. ficifolia*, *C. palmata*, *C. argyrosperma*.

##### VERNACULAR NAMES

Sanskrit: Kushmanda beeja

Hindi: Kaddu ke beej

English: Pumpkin seeds, pepitas

Gujarati: Kolundana

#### 2.1.2 PLANT DESCRIPTION

The Cucurbitaceae family includes pumpkins with oily seeds. Although there are many cultivars growing around the world, the most significant species for commerce are *Cucurbita pepo*, *C. maxima*, *C. moschata*, *C. mixta*, and *C. stilbo* [12]. Pumpkin is cultivated from northern Mexico to Argentina and Chile and has spread to Europe (France and Portugal, for example), Asia (India and China) and Western America. Pumpkin is an annual vine or trailing plant and can be cultivated from sea level to high altitudes [56]. Pumpkins are grown all throughout the world for a variety of functions, including commercial, decorative, and agricultural usage [12]. It is famous for its edible seeds, fruit and greens [56]. The most important part of pumpkin is its low-fat and protein-rich seeds [28]. The second most important part is its fruit. The mature fruit is sweet and used to make confections and beverages, some of which may be alcoholic, while the immature fruit is cooked as a vegetable. The fruit offers a modest amount of carbs, vitamins, and minerals, as well as a good amount of b-carotene. Throughout the pumpkin plant's distribution range in America, various portions of the plant have been used in various eating regimens. The flesh of the ripe fruit is used to make sweets and soft or mildly alcoholic beverages, while the unripe fruit is consumed as a boiled vegetable. In Chiapas, Mexico, seeds are also highly valued and are combined with honey to make delicacies called palanquetas. The oleic acid-rich pumpkin seed can also be used to make edible oil [56]. Phytosterols found in abundance in pumpkin (*Cucurbita pepo*) effectively prevent testosterone from being converted into dihydrotestosterone (DHT). Unsaturated fatty acids, particularly oleic and linoleic acids, are abundant in pumpkin seed oil. These essential acids are thought to inhibit 5 $\alpha$ -reductase, which suggests that they may promote hair development by acting as an anti-androgen [23]. Researchers are focusing on this crop as a result of the widespread use of pumpkin in traditional medicine [9]. Although most people

consider pumpkin seeds to be agricultural trash <sup>[8]</sup>, they are actually nutritious powerhouses with unique nutraceutical qualities. Due to its ethnomedical advantages, pumpkin seeds are being consumed more frequently both in Africa and abroad <sup>[5]</sup>. The seeds are typically salted and roasted before being eaten as a snack. Additionally, they are utilized as food additives in the baking sector <sup>[2]</sup>.

### 2.1.3 PHARMACOGNOSY OF PUMPKIN SEEDS <sup>[32]</sup>

**Synonyms:** Pepitas, Squash seeds, Cucurbita pepo seeds, gourd seeds, Pumpkin kernel, Cucurbit seeds.

**Biological Source:** Pumpkin seeds are the edible seeds of the pumpkin plant, scientifically known as *Cucurbita pepo* or *Cucurbita maxima*. These seeds are typically flat, oval shaped and green when fresh.

**Family:** Cucurbitaceae



**FIGURE 4: PUMPKINS**

**Geographical Source:** Western hemisphere and is widely grown in countries in Tropical Asia like Indonesia, Malaysia, and the Philippines.

**Chemical Constituents:** Phytosterol, Unsaturated fatty acid, Vitamin (E, K, B), Protein, Fiber, Mineral (Magnesium, Phosphorus, Zinc and Iron), Antioxidants and Phospholipids.

**Traditional Uses:** Pumpkin seeds have a history of traditional use in various culture for their supposed medicinal properties.

They have been used for treating conditions like prostate problems, Urinary issues and intestinal parasites.

Pumpkin seeds have also been incorporated into traditional cuisine for their nutrition.



**FIGURE 5: PUMPKIN SEEDS**

### 2.1.4 PHARMACOLOGICAL ACTIVITIES OF PUMPKIN SEEDS

Pumpkin, a traditional medicine plant, has gained recognition for its therapeutic properties. Bioactive substances from natural sources can be used to treat various medical disorders. Pumpkin contains bioactive chemicals like antioxidant, antidiabetic, anticarcinogenic, antimicrobial, antiparasitic that offer health advantages.

### **INHIBITION OF DHT [17]**

The antiandrogenic properties of pumpkin seeds are being studied because they may be able to lessen the effects of androgens, notably dihydrotestosterone (DHT), on hair follicles. Particularly in cases of androgenetic alopecia (pattern baldness), DHT is linked to hair loss. Compounds in pumpkin seeds, including phytosterols and unsaturated fatty acids like oleic and linoleic acids, are thought to have antiandrogenic properties. These substances may help to maintain healthy hair and prevent hair loss because they prevent testosterone from being converted into DHT or prevent DHT from connecting to its receptors in hair follicles.

### **ANTIOXIDANT [56]**

Oxidative stress is a common cause of chronic diseases and their complications. Pumpkin seed contains natural antioxidants like tocopherol and carotenoid, which may protect against toxic substances and free radicals. The methanolic extract of pumpkin seeds contains phenolic compounds that significantly increase superoxide dismutase and glutathione peroxidase activities, while reducing malonaldehyde concentration. Pumpkin polysaccharide also increases superoxide dismutase and glutathione peroxidase activity, while its excellent antioxidant potential is due to cucurbitacins free radical scavenging ability.

### **ANTIDAIBETIC [3, 41]**

Diabetes is a growing global disease that can cause severe health issues if not managed properly. *Cucurbita pepo*, a plant with active hypoglycemic properties, has been found to be effective in long-term management. Pumpkin seeds contain antidiabetic components and antioxidant activities, which can alleviate diabetes. Pumpkin's protein-bound polysaccharides improve glucose tolerance and its rich pectin content can control glycemic levels. A *Cucurbita pepo*-rich diet could supplement existing antidiabetic drugs and reduce pre-diabetic individuals diabetes risk.

### **ANTI CARCINOGENIC [25]**

Natural products from plants, including alkaloids, carotenoids, flavonoids, terpenoids, polysaccharides, and cucurbitacins, have potential anticancer properties. Cucurbitacins, which are nitrogen-containing compounds, have apoptotic effects due to their ability to switch genes and activate or inhibit pro- or antiapoptotic proteins. Pumpkin seeds, including crude extract and purified fractions, have shown anticancer activity against melanoma, ascites, and leukemia. The phytoestrogen compounds in pumpkin seeds also exert anticancer effects, particularly in breast cancer. The oil from pumpkin seeds inhibits testosterone-induced hyperplasia and inhibits cancer cell proliferation and hyperplastic cells, with a weaker effect on non-hyperplastic cells.

### **ANTIMICROBIAL [4]**

Microorganisms and parasites are major causes of death, disability, and social and economic disruption for millions of humans. Pumpkin fruits have *Enterococcus faecalis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Salmonella enterica* subsp. *enterica*, *Serratia marcescens*, *Staphylococcus aureus*, and *Candida albicans*. *Cucurbita pepo* leaves show the largest spectra of activity against *Providencia stuartii*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Escherichia coli*, *Enterobacter aeruginosa*, and *Enterobacter cloacae*.

### **ANTIPARASITES [29]**

Antiparasitics are primarily derived from synthetic or semisynthetic sources, which can cause significant toxicity to humans. To address this issue, Pumpkin extract can be a potential alternative to synthetic antiparasitics due to its potent antiparasitic properties. Pumpkin extract, rich in cucurbitacins, cucurbitins, cucurmosins, saponins, and sterols, can prevent and treat nematode-related diseases. Pumpkin proteins also possess antifungal properties, inhibiting pathogenic fungal proteases



without toxicity for human erythrocytes. Pumpkin seed, including peptides, proteins, and linoleic acid, has broad-spectrum antimicrobial activity against various microorganisms.

## 2.2 BLACK CUMIN SEEDS

### 2.2.1 BOTANICAL REVIEW

#### TAXONOMICAL CLASSIFICATION: [21]

Kingdom: Plantae

Subkingdom: Viridiplantae

Infrakingdom: Streptorhyta

Superdivision: Embryophyta

Division: Tracheophyta.

Subdivision: Spermatophytina.

Class: Magnoliopsida

Superorder: Ranunculanae

Order: Ranunculales

Family: Ranunculaceae

Genus: *Nigella L.*

Species: *Nigella Sativa L.*

#### VERNACULAR NAMES:

Sanskrit: Krishna- Jiraka, Vrishanam, Upakunchika

English: Fennel flower seeds, Black cumin seeds, Roman coriander seeds, Black caraway seeds or Blackseed, Nutmeg flower

Hindi: Kalonji, Kalaunji, kala jeera

Gujarati: kalo jeeru

### 2.2.2 PLANT DESCRIPTION

*Nigella sativa L.* (Ranunculaceae), popularly known as black cumin or black seeds, is a popular culinary herb that has long been prized in traditional medicine. It is also a potent remedy [19]. The plant *Nigella sativa*, also known as kalonji, is an annual blooming plant that is native to south west Asia and is grown in the Middle East, South Europe, Syria, Turkey, Saudi Arabia, Pakistan, and India [42]. Because of its numerous uses, the plant has been assigned a high status in the religion of Islam. It is one of the most effective medicinal plants, according to the religion. The black seed, according to the Islamic prophet Muhammad, may cure all illnesses except for death. *Nigella* is referred to as the seed that promotes the body's energy and aids recovery from exhaustion and dejection by Avicenna, who is best known for his works collectively known as The Canon of Medicine. According to the tradition that "holds onto the use of the black seeds for healing all diseases," it is also listed among the natural medicines of "Tibb-e-Nabavi," or "Medicine of the Prophet (Muhammad)". *N. saliva* is regarded as a valuable treatment for a multitude of ailments in the Unani Tibb medical system [39]. Due to its abundance in various phytochemicals, nutritionally important components, and polyunsaturated fatty acids (PUFA), NS has medicinal properties. NS oil is listed as "Generally Recognized as Safe" by the US Food and Drug Administration (FDA) [21]. A wonderful spice with a rich literary and religious history is *Nigella sativa*. *Nigella sativa* is a widely used therapeutic plant in the Ayurvedic medical system. The seeds of *N. sativa* are used in dropsy, loss of appetite, vomiting, and obstructed hiccups in addition to buttermilk. Numerous Ayurvedic formulas are used to cure various illnesses, such as obesity and dyspnea. Additionally, seeds are utilized for leprosy, sores, and mercury toxicity [52]. The nutrition and health of humans are significantly influenced by black cumin seed oil. It is thought to be among the most recent sources of edible oils. Additionally, there has been a lot of interest in the chemical variety and practical qualities of the volatile chemicals found in cumin seeds [6]. Black cumin is a significant source of nutraceuticals since its potent phytochemicals and essential elements both support the immune system and overall health of the human body [19].

### 2.2.3 PHARMACOGNOSY OF BLACK CUMIN SEEDS [39]

**Synonyms:** Kalonji seeds, Fennel flower Black cumin, Black seeds, Nigella seeds, Roman coriander.

**Biological Source:** It is obtained from the seeds or dried seeds of *Nigella sativa*.

**Family:** Ranunculaceae



**FIGURE 6: NIGELLA SATIVA FLOWER**

**Geographical source:** Native to south west Asia and cultivated in countries like middle eastern Mediterranean region, South Europe, Syria, Turkey, Saudi Arabia, Pakistan, India.

**Chemical constituents:** Thymoquinone, Nigellimine-n-oxide, Niglidine, Dithymoquinone, Thymohydroquinone, Thymol, Arvacrol, 6-methoxy-coumarin, 7-hydroxy coumarin, Oxycoumarin, Alpha-herdin and Steryl-glucoside.

**Traditional Uses:** Black cumin seeds have been used for centuries in traditional medicine for their potential health benefits as an anti-inflammatory, digestive health, respiratory health, weight management.

They contain antioxidants that may help protect cells from damage caused by free radicals.

They are also used for culinary as a spice, seasoning, garnish.

- Black cumin seed oil is used in skincare products for its potential benefits in reducing acne, moisturizing the skin, and soothing irritation.
- It's also used in hair care products for strengthening hair and promoting hair growth.

Black cumin essential oil, derived from the seeds, is used in aromatherapy for its potential calming and soothing effects.

In some cultures, black cumin seeds are used as a natural remedy for a variety of ailments, from colds and headaches to diabetes and hypertension.



**FIGURE 7: NIGELLA SATIVA SEED**

## **2.2.4 PHARMACOLOGICAL ACTIVITIES OF BLACK CUMIN SEEDS [1]**

Black cumin is widely used as a drug to treat a variety of illnesses, with cancer-related illnesses at the top of the list due to the presence of pharmacologically active compounds in the spice.

*N. sativa* is helpful in treating a number of illnesses, including those that affect the heart and respiratory system.

Its active ingredients have the potential to treat many diseases.

Thymoquinone and nigellone are two supreme oils (volatile) found in *N. sativa* seeds, according to scientist Wagner.

Thymoquinone has anti-inflammatory and antioxidant property can reduce split hair and prevents greying of hair. Black cumin oil possesses antifungal properties that are beneficial to treat dandruff and the oil maintains the moisture content in scalp, thus helps in protecting the scalp condition [38]

### **ANTI OXIDANT [1]**

Thymoquinone, a bioactive compound in black cumin, is an anti-oxidant agent that functions as a superoxide radical and free radical forager. It conserves enzymes like glutathione-S-transferase, catalase, and glutathione peroxidase. Black cumin seeds develop anti-oxidant defense abilities by reducing lipid peroxidation and increasing antioxidant enzymes.

### **ANTIFUNGAL [15]**

The antifungal activity of the volatile BCSO constituents, such as thymoquinone, carvacrol and 3,5-dimethyl cyclohexanol, is remarkably similar to that of fungi. However, two further events that prevent yeast from acting are important to note: the creation of a pH gradient throughout the yeast's inability to produce energy due to disruption of the cytoplasmic membrane and the fungus membrane.

### **ANTI INFLAMMATORY [14]**

Anti-inflammatory activity refers to a substance or treatment's ability to reduce inflammation. Anti-inflammatory drugs account for about half of all analgesics. BCS volatile compounds and their components were assessed for their anti-inflammatory properties by measuring their ability to stop cellular nitric oxide (NO) production. Nitric oxide, an endogenous free radical, is linked to various diseases and inflammations and is crucial for physical homeostasis. Research shows that  $\alpha$ -thujene,  $\beta$ -pinene, p-cymene,  $\gamma$ -terpinene, terpinolene, 4-terpineol, thymoquinone, carvacrol, longifolene, and peonol mediate their inhibitory effect on NO production.

### **CARDIOVASCULAR ACTIVITY [50]**

Cardiovascular diseases (CVD) cause nearly 17.7 million deaths worldwide, accounting for 30% of all deaths. The main causes include high cholesterol, low density lipoproteins, hypertension, and atherosclerosis. Black seeds, rich in plant sterols, can reduce capillary brittleness, increase blood vessel strength, prevent coagulum development, and lower blood pressure. *N. sativa* seeds have cardioprotective potentials, reducing cardiovascular system injuries and diseases. Thymoquinone, an active ingredient, helps treat endothelial layer abnormalities, contributing to heart diseases.

### **ANTI DAIBETIC [1]**

Diabetes is a metabolic condition characterized by high blood sugar levels, frequent urination, and dehydration. It can lead to serious health issues like heart problems and kidney failures. Type 1 diabetes occurs when the pancreas fails to produce enough insulin, while type 2 diabetes occurs when cells fail to respond properly. Oxidative stress (OS) plays a significant role in diabetic complications. Black cumin seeds, which reduce OS and preserve insulin-producing cells, have been traditionally used to treat diabetes.

## 2.3 BURDOCK ROOT

### 2.3.1 BOTANICAL REVIEW

#### TAXONOMICAL CLASSIFICATION

Kingdom: Plantae

Phylum: Angiosperms

Class: Eudicots

Order: Asterales

Family: Asteraceae

Genus: *Arctium*

Species: The common burdock is scientifically known as *Arctium lappa*, while the lesser burdock is known as *Arctium minus*.

#### VERNACULAR NAMES

Sanskrit: Utpala, Brihacchad

English: Burdock, Greater burdock, Edible burdock, Lappa

Hindi: Baradak

Gujrati: Jungli kuth

### 2.3.2 PLANT DESCRIPTION

*Arctium lappa* L. (Asteraceae), sometimes known as "burdock" or "bardana," was introduced from Asia and has since spread throughout the world, including Brazil. An essential plant for detoxification in both Chinese and Western natural remedies is *A. lappa* <sup>[10]</sup>. *A. lappa*, often known as burdock, gets its name from the Greek words arktos, which means "bear," and lappa, which means "to seize," and is promoted as a wholesome food in Chinese culture among other cultures. Around the world, *A. lappa* is commonly utilized in conventional medicine. The plant has long been grown as a vegetable for human consumption and is also employed as a folk remedy for a number of distinct illnesses and maladies <sup>[44]</sup>. The petiole, young leaves, and sprouts of burdock are also consumed along with the raw or cooked burdock root in a variety of cuisine recipes. The root has a sweet, mild, and pungent flavor and is quite crisp. According to reports, burdock is a native of northern Europe, northeast Asia, and northern India. It has spread over the world and is now growing wild throughout Europe and North America, where it is utilized as a folk remedy. When it was brought to Japan a thousand years ago, the Japanese developed it as an edible vegetable. Burdock is now widely grown in Japan, Taiwan, China, as well as certain highland nations in Southeast Asia, primarily for export to Japan. Burdock is a cold-climate, temperate crop that does best from 18 to 28 °C in direct sunlight and is vulnerable to frost. Deep, well-drained sandy loam, freshly worked soil, and soil rich in humus or nitrogen are desirable for burdock roots of high quality. Nitrogen fertilizer stimulates the growth of burdock <sup>[26]</sup>. Different plant parts, including the roots, leaves, seeds, and fruits, are said to have therapeutic uses and are used in folk medicine to treat intoxications, throat infections, boils, rashes, and other chronic skin ailments. The leaves are used to treat burns, ulcers, sores, and heat clearance, but the roots and seeds are also used as diuretics, antipyretics, and blood detoxifiers <sup>[10]</sup>. Since ancient times, burdock has been utilized in folk medicine throughout the world. Burdock oil was used to treat trophic ulcers, lice, rashes, and rashes as well as to strengthen and nourish hair <sup>[13]</sup>. The roots, leaves, and seeds of burdock are used medicinally. Decoctions and infusions are made based on the roots. Fresh and liquid extracts of the root are also used. The powdered root of burdock is used in recipes for medicines. The plant's root is used to make the renowned "burdock oil" after being infused with olive or almond oil. The root is used to make therapeutic tea, tinctures, and ointments. Burdock leaves are used to make decoctions, compresses, and lotions. For a variety of skin conditions, fresh burdock juice is employed. Fresh burdock root is used in homeopathy <sup>[53]</sup>. Since ancient times, great burdock has been utilized as a medicine. The oil from the root and leaves (*Oleum Bardanae*) is said to have antibacterial, diuretic, hair-growth-stimulating, and anti-inflammatory properties <sup>[36]</sup>.

### 2.3.3 PHARMACOGNOSY OF BURDOCK [26]

**Synonyms:** Bardana, Beggar's Button, Gobo

**Biological Source:** It is obtained from the dried tubers and roots of *Arctium lappa*.

**Family:** Asteraceae



**FIGURE 8 : BURDOCK ROOT**

**Geographical source:** Burdock (*Arctium lappa*) is a plant that is native to Europe and Northern Asia. It has naturalized in various regions around the world and can now be found in North America and other parts of the world.

**Chemical constituent:** Inulin, Lignans, Polysaccharides, Tannins, Phenolic acids, Sesquiterpenes, Vitamins and Minerals, Fatty acids, Flavonoids, Phytosterol.

**Traditional Uses:** In traditional herbal medicine practices, burdock root has been used to treat various ailments, such as colds, coughs, and urinary tract infections.

Burdock roots also used in Culinary Use for making pickles, vegetable stir-fries, tempura

As an herbal medicine for detoxifying, blood purification, digestive aid, anti-inflammation, and skin health

Some hair care and cosmetic products include burdock root extract for its potential benefits in promoting healthy hair and skin.



**FIGURE 9: BURDOCK ROOT**

#### **2.3.4 PHARMACOLOGICAL ACTIVITIES OF BURDOCK ROOTS [31]**

*A. lappa* has been widely used as an ethnomedicinal plant in traditional systems of medicine, primarily in Europe, Asia, and North America, and is frequently used to treat a wide range of conditions, including rheumatoid arthritis, gout, Type 1 and Type 2 diabetes, and dermatological complications. The plant has been used to treat a wide range of illnesses, including eczema, psoriasis, arthritis, and various skin-related conditions. It has also been used to treat cancer. As an antidote to mercury poisoning, its roots have been used. Additionally, *A. lappa* has been used to treat adult alopecia (hair loss). It has demonstrated a wide range of pharmacological activities, including anti-fertility, anti-cancer, anti-diabetic, antioxidant, anti-inflammatory, antimicrobial, and gastroprotective effects. Anti-ulcerative colitis, anti-allergic, etc. compounds with potential mechanisms of action and biological activity.

#### **ANTI ALLERGIC AND ANTI INFLAMMATORY [44]**

Numerous immune disorders, including allergy and atopic inflammation, can be prevented and treated with traditional medicines derived from natural substances. By reducing the release of  $\beta$ -hexosaminidase in mast cells and the secretion of IL-4 and IL-5 in Con A-induced T cells, the butanol fraction of *A. lappa* demonstrated potential anti-allergic and anti-inflammatory effects. The production of pro-inflammatory mediators like tumor necrosis factor (TNF) and prostaglandin E2 (PGE2) in cells treated with or without the *A. lappa* fruit extract as well as the release of  $\beta$ -hexosaminidase, a key biomarker of degranulation during an allergic reaction.

#### **SKIN INFECTION [44]**

*A. lappa* is effective in treating acne, seborrheic, and foruncular dermatitis due to its stimulating, detoxifying, and impurity-removing properties. Its roots contain antifungal and antibiotic properties, combating acne-causing bacteria and aiding in the elimination of impurities through the gastrointestinal tract.

#### **ANTI MICROBIAL [31]**

In traditional medicine, the roots and leaves of *A. lappa* are consumed in salad. Studies conducted in vitro have suggested a possible prebiotic effect. The plant's lyophilized leaf extract demonstrated antimicrobial activity, particularly against bacteria linked to endodontic pathogens like candida albicans, lactobacillus acidophilus, pseudomonas aeruginosa, and bacillus subtilis. Its root extract, which contains chlorogenic acid, exhibits antibacterial activity against Klebsiella pneumoniae as well as anti-lactamase activity. In addition, it prevents both candida and Escherichia coli from forming biofilms.

### **ANTI AGING** [26]

The anti-ageing effect of Niubangen (burdock root) decoction was primarily attributed to the increased superoxide dismutase activity in the liver tissues and blood serum of decoction-fed rats and the decrease in malondialdehyde in the brain tissue, blood serum, and lipofuscin contents. In-vivo studies demonstrated that topical application of a natural *A. lappa* fruit extract significantly improved the metabolism of the dermal extracellular matrix. Pure arctiins supplemented in vitro studies on human dermal fibroblasts and monocyte-derived dendritic cells demonstrated an increase in collagen synthesis and a decrease in interleukin 6 and tumour necrosis factor-alpha concentrations in comparison to untreated control cells.

### **ANTI ULCERATIVE** [31]

According to some theories, T cells (T helper 1 & 17 cells) and other cytokines related to them play a role in the pathogenesis of ulcerative colitis. It has been demonstrated that *A. lappa* can treat ulcerative colitis. Concanavalin A-induced T cell proliferation was inhibited by arctigenin from *A. lappa* in a dose-dependent manner. In reality, it inhibits RORt. There is sufficient proof that *A. lappa*, specifically arctigenin, significantly lessens vasospasm caused by subarachnoid hemorrhage in animal models.

### **CONCLUSION**

This review aims to provide a valuable resource for researchers, clinicians, and individuals seeking natural alternatives to promote healthy hair and prevent premature graying. Understanding the mechanisms and evidence behind the use of Pumpkin Seeds, Black Cumin Seeds, and Burdock Roots can pave the way for future developments in botanical-based hair care products and holistic approaches to hair health.

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