

FORMULATION AND EVALUATION OF HAIR SETTING GEL BY USING ONION OIL, BAHEDA

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Abstract

The follicle is one amongst the characteristic features of mammals is a singular mini-organ. In humans, hair has various functions like protection against external factors, sebum, apocrine sweat and pheromones production, and thermoregulation. The hair also plays an important role in the individual's social and sexual interaction. The follicle is a reservoir for epithelial and melanocyte stem cells and it's capable of being one in all the few immune-privileged sites of form. follicle development is expounded to the interactions between epithelial and mesenchymal cells. Many genes play a substantial role during this interaction and also in follicle cycling.

Keyword: Hair growth, Antihypertensive, AlliumcepaL., Quercetin

1. INTRODUCTION

1.1. Hair and Follicle Morphology

In utero, the type and distribution of every follicle over the whole body are determined. The genes that are expressed before the signs of follicle formation constitute the precise spacing and distribution of the follicles. The protein products of those genes are presented during the various phases of the hair cycle, indicating that they're so important for the conventional development and distribution of follicles yet as for the continuing growth process. The initial "message" for the event of every type of skin appendages is from the dermal mesenchyme and follicle development begins with the buildup of epithelial cells to create epithelial placode after the initial mesenchymal signals.

Thereafter, the epithelial placode expands and generates the first hair germ. The second signal arises from epithelial placode and constitutes a cluster of adjacent mesenchymal cells which later develops the dermal papilla (DP). the final word signal from this primitive dermal papilla to the epithelial placode cells indicates a rapid proliferation and differentiation. This consecutive signaling process finally ends up in the assembly of the mature follicle. it's surrounded by mesenchymal cells that eventually transformed into the fibrous sheath. Outer root sheath (ORS) generates two bulges along the side of the follicle, the proximal bulge is a reservoir for epithelial stem cells and therefore the distal bulge evolves to sebaceous glands. During the event of bullous peg (stages 5–8), the hair bulb and also the main cell layers of the mature follicle are formed. Several molecular pathways, growth factors, proteins, and genes play substantial roles in the event of the follicle. Canonical (β -catenin dependent) WNT (wingless-type integration site) signals are candidates for the initial dermal message, and it's believed that they precede other activators and regulators of appendage development. β -Catenin is the downstream mediator of WTN signaling. Activation of this β -catenin pathway seems to be essential for the epithelial ability of follicle production. Ectodysplasin (EDA) and its receptor (EDAR) are other important pathways involved within the placode stage of hair morphogenesis. The mouse EDAR mRNA is expressed within the epithelium before placode formation, then becomes restricted to placodes, whereas the EDAR is critical for placode development in primary hair follicles but not for induction of secondary hair follicles, which utilize signaling pathways that involve Noggin and SRY- box 18 (SOX18) expression within the dermal papilla. In summary, the formation of placodes in response to the primary dermal signal

involves activation of EDA/EDAR signaling within the epithelium, followed by epithelial WNT signaling, and subsequent activation of BMP signaling. The actions of EDA/EDAR and WNT promote placode formation, whereas BMP signaling represses placode fate in adjacent skin. Human follicle morphogenesis occurs one time. The first “coat” that’s formed is okay, long, variably pigmented lanugo hair, which is shed in an anterior to posterior wave during the last trimester of gestation. The second coat of fine, shorter, unpigmented lanugo hair then grows altogether areas except for the scalp and is shed 3–4 months after birth. After these first two cycles, hair starts to grow in an asynchronous mosaic” pattern instead of in waves.

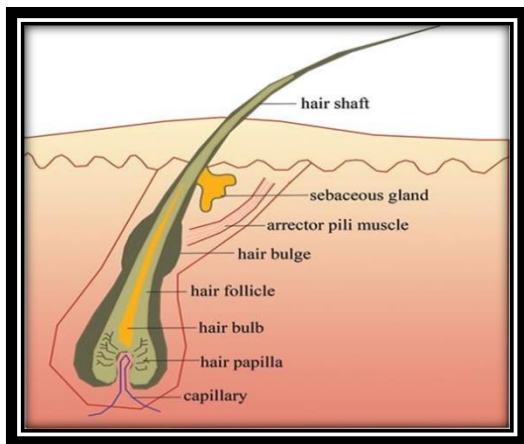


Fig-1. Morphology of Hair

2. HAIR ANATOMY

2.1. Structure of The Hair:

Hair consists of two distinct structures: follicle—the living part located under the skin and hair shaft—fully keratinized nonliving part above the skin surface. The arrector pili muscle takes place in the middle of the hair bulge area and dermo-epidermal junction. Above the insertion of the arrector pili muscle, sebaceous glands, and, in some certain regions, apocrine glands are opened into the follicle.

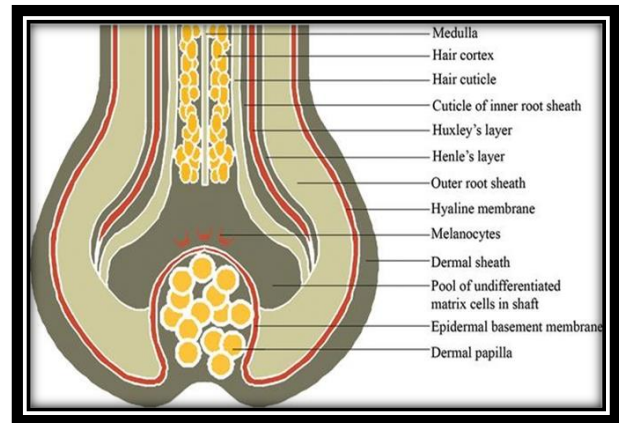


Fig-2. Internal Structure of Hair

These imbricated surfaces also facilitate the removal of dirt and desquamated cells from the scalp. The cuticle has also important protective properties and barrier functions against physical and chemical insults. During the migration of the cells from the hair bulb to compose the cortex, the shapes of them become more fusiform. These cells coalesce tightly and are placed parallel to the axis of the shaft. Several microfibrils close to making larger units called microfibril which represents almost 50% of the cortex material. The cortex comprises the majority of the shaft and also contains melanin. Medulla is found within the center of the hair shaft preferably presented in coarser fibers. The hair medulla contains structural proteins that are markedly different from other hair keratins and eosinophilic granules that are filled by an organic compound, citrulline, and eventually form internal coatings within the membranes of mature cells. The follicle is that the essential growth structure of the hair and has two distinct parts: the upper part consisting of infundibulum and isthmus though the minor portion consists of the hair bulb and suprabulbar region. The upper follicle remains constant, while the lower part has continuous cycles of regeneration. The infundibulum, the uppermost portion of the follicle extending from the opening of the oil gland to the surface of the skin, could be a funnel-shaped structure crammed with sebum, the merchandise of the sebaceous glands. The upper part named acroinfundibulum, the keratinization of epithelium turns into the “epidermal mode”, with the formation of stratum and horny layer sort of a similar manner to the epidermis.

The isthmus is that the lower portion of the upper a part of follicle between the opening of the glandulae

sebaceae and also the insertion of arrector pili muscle. At the isthmus level, epithelium keratinization begins with the shortage of granular layer named "trichilemmal keratinization". Only a few differentiated corneocytes remain and also the invagination of the epidermis during this area must be considered as highly permeable for topically applied compounds. follicle stem cells are thought to reside within the bulge area on the isthmus near the insertion of the arrector muscle. Lineage studies have proven that bulge cells are multipotent which their progeny generates the new lower anagen follicle. one in every of the foremost distinguishing features of stem cells is their slow-cycling nature, presumably to conserve their proliferative potential and to attenuate DNA errors that might occur during replication. They migrate in a very downward direction. Upon entering the hair bulb matrix, they proliferate and undergo terminal differentiation to create the hair shaft and inner root sheath. They also migrate distally to create sebaceous glands and to proliferate in response to wounding. The suprabulbar region of the follicle, below the isthmus and above the hair bulb, is comprised of three layers from outermost to innermost: outer root sheath, inner root sheath, and hair shaft. Outer root sheath (ORS) extends from the epidermis at the infundibulum and continues to the hair bulb and its cells change considerably throughout the follicle. within the infundibulum, it resembles epidermis, whereas, within the isthmus level, ORS cells begin to keratinize in an exceedingly trichilemmal mode. Keratinocytes within the ORS form the bulge area at the bottom of the isthmus. At the lower tip of the hair bulb, it consists of one layer of cuboidal cells, becoming multilayered within the region of the upper hair bulb. In some follicles, there's a definite single cell layer interposed between the outer and inner root sheaths, referred to as the companion layer. Companion layer cells show numerous intercellular connections to the inner root sheath and are thought to migrate distally together with the inner root sheath to the isthmus region and to make the plane of slippage between the inner and outer root sheaths. The ORS of the follicle also contains melanocytes, Langerhans cells, and Merkel cells. These cells happen in certain functions of the follicle like acting as a sensory organ and serving as an immunologic sentinel for the skin. Inner root sheath (IRS) contains three layers: Henle's layer, Huxley layer, and cuticle layer. The innermost layer is that the cuticle of IRS

whose cells interlock with those of the hair cuticle. This connection, anchoring the hair shaft to the follicle, is so tight. The inner root sheath hardens before the presumptive hair within it, so it's thought to regulate the definitive shape of the hair shaft. Each of the three layers of the IRS undergoes abrupt keratinization. this happens at different levels in each layer; however, the patterns of change are similar. Keratinization first appears in Henle's layer, the outermost. Huxley layer is keratinized above the Henle's layer at the region called Adamson's fringe. The IRS coats and supports the hair shaft up to the isthmus level where the IRS disintegrates. The expanded onion-shaped portion of the lower follicle, including the hair matrix and therefore the follicular papilla, is understood because the hair bulb which is that the active reproductive portion of the follicle. The hair bulb encloses follicular dermal papilla, mucopolysaccharide-rich Stromer, nerve fiber and a capillary loop. The matrix cells are localized to the lowermost portion of the follicle and surround all sides of the follicular papilla. The IRS comes from the lower and laterally located matrix cells, whereas the hair shaft is originated from upper and centrally located cells. additionally, to producing the most structural components of hair, they also produce the hair keratins, and their associated proteins (KAPs). Melanocytes reside among matrix stem cells to supply the pigment of the hair. During their differentiation phase, matrix cells phagocytose melanin or pheomelanin from the dendritic elongations of melanocytes. The hair assumes its color via the number and therefore the form of the phagocytized major pigment. Follicular papilla, which springs from condensation of mesenchymal cells at the first stages of follicular embryogenesis, is one in all the foremost important players during the induction and maintenance of the follicular epithelial differentiation. it's answerable for determining the follicle type. the degree and secretory activity of follicular papilla and also the quantity of matrix stem cells determine the scale of the anagen hair bulb, the duration of the anagen phase, and therefore the diameter of the hair shaft. Moreover, the follicular papilla is an important source of growth factors

3. HAIR SETTING GEL

Hair gels are a styling important for everyone who loves testing with looks. From adding volume to defining curls and taming flyaways, this product is extremely versatile

when it involves facilitating different styles and appears. However, employing a bad product can make your hair dull and lifeless. As the name says, a straightforward definition of toiletry could be a jelly-like substance employed in styling a person's hair. toilet article could be a popular hair styling product that is employed to harden hair into the required hairstyles. toilet article supports your hair putting it into a selected hairstyle. it's mostly composed of water and should contain different humectants, proteins, conditioners, and oils. there's a large range of various varieties of hair gels within the market. toilet article will be applied to wet or dry hair, but it's best to use to the wet hair. The gel isn't quite designed for dry hair, so it's better you apply the gel to your wet hair and let it air-dry or use a hairdryer. Hair gel may be a styling product that comes in a traditional gel consistency, liquid consistency, or a sprig. It usually comes in several holding strengths, from light to strong, and provides a wetter look than mousse or hairspray. When styling with gel, it is best to use the gel to wet hair and either let your hair air dry or blow it dry with a hairdryer. The gel isn't designed to be used on dry hair.

3.1. Advantages

Strong shaping and support capabilities. If your hair is thick enough, the mousse will be strong and long-lasting for your hair. Even within the windy weather, there'll be no turmoil in your hairdo

3.2. Disadvantages

Many shapes require plenty of mousses, which can make your hands sticky. At the identical time, if the hair is formed, there are no other thanks to simply change the form except to clean the hair with quandary to melt the hair mousse. The gel may be a less popular hairstyling product than mousse or creams because it's several drawbacks. Gels are sticky to use until they're dry. Since they're water-soluble, if it's rainy or especially humid, the gel might get sticky again or deactivate altogether. Some gels contain alcohol, which might stain certain fabrics and dry out hair. If you have already got dry hair, gels with alcohol are bad choices for you. Gels rest on hair follicles over time, especially with everyday use. If you intend to use the gel as your primary hairstyling product, you'll be wanting to use a clarifying shampoo a minimum of once every week. There are low-quality and

high-quality gels. in keeping with All Hairstyles Haircuts, if you apply a low-quality gel to coarse hair, the hair will get sticky and coarser than it was within the first place. They make the hair frizzy, thereby giving rise to unmanageable, dry, rough, limp, and lusterless tresses.

3.3. Marketed Product

1. Discoloration and damage
2. Drying and dehydrating the hair
3. Hair gel information
4. Garnier Fructis Style Pure Clean Styling Gel
5. Jolen Firm Hold Hair Gel
6. Set Wet Style Casual Hold Gel

4. AIM AND OBJECTIVE

4.1. Aim:

Formulation and Evaluation of Hair Setting Gel By Using Onion Oil

Objective:

1. To formulate to reduce hair loss
2. Give natural black color to hair

5. ABOUT ACTIVE:

5.1. Onion:

Onion(*Alliumcepa*L.)has been valuing dasa food and medicinal plant sinceanc ienttimes. It is widely cultivated, the second only to tomato, and could be a vegetable bulb crop known to most culture sand consumed worldwide. It is commonly called "Star of the kitchen," Onion is used through out the year, as an example in curries, within the style of spices, in salads, as a condiment, or cooked with other vegetables, like boiled or baked. it's also used in different kinds of processed food, e.g.pickles, powder, paste, and flakes, and it's known for its medicinal values. it also uses in the cosmetic industry. They reduce hair loss and increases the expansion rate of hair.

- **Kingdom:** Plantae
- **Subkingdom:** Tracheobionta
- **Superdivision:** Spermatophyta
- **Division:** Liliopodia

- **Subclass:** Liliales
- **Order:** Liliaceae
- **Genus:** *Allium*
- **Species:** *Allium cepa*L.
-

Nutrients:

Most onion cultivars are about 89% water, 9% carbohydrates (including 4% sugar and 2% dietary fiber), 1% protein, and negligible fat (table). Onions contain low amounts of essential nutrients and have an energy value of 166 kJ (40 Calories) in a 100 g (3.5 oz) amount. Onions contribute savory flavor to dishes without contributing significant caloric content.

5.2. Chemical constituent

| Chemical constituent | Quantity |
|-----------------------|------------------|
| Energy | 166 kJ (40 kcal) |
| Carbohydrates | 9.34 g |
| Sugars | 4.24 g |
| Dietary fibre | 0.1 g |
| Fat | 1.7 g |
| Protein | 1.1 g |
| Vitamins | 4% 0.046 mg |
| Thiamine | 2% 0.027 mg |
| Riboflavin (B2) | 1% 0.116 mg |
| Niacin (B3) | 2% 0.123 mg |
| Pantothenic acid (B5) | 9% 0.12 mg |
| Vitamin B6 | 2% 0.123 mg |
| Folate (B9) | 5% 19 µg |
| Vitamin C | 2% 0.123 mg |
| Minerals | 4% |
| Calcium | 2% 23gm |
| Magnesium | 5% |
| Phosphorus | 0.25 mg |
| Potassium | 3% 146 mg |
| Zinc | 2% 0.17 mg |

5.3. Extraction Process:

The extraction utilized was steam distillation, which was carried out as follows: a weighed amount of ground onions (approximately 1000 g) they dry and placed in a four-liter round bottom flask with two outlets. This container was heated with a heating mantle to 100°C to

maintain a homogeneous temperature in the flask during the distillation operation (see Fig. 2). One of the outlets of the container was connected to a steam generator which was simply a container with boiling water; the other outlet of the first container was connected to the condenser, and the condenser was connected to a condensate receiver. The ground onion in the distillation flask was heated to 100°C and the steam was injected into the mixture until 500 ml of condensate was collected. It was determined that no further oil was extracted after 500 ml of condensate was collected. The condensate was then subjected to liquid-liquid extraction with the. Experimental solvent. Again, for solvents partially soluble in water, sodium sulfate was used to separate this contaminant from the oil solution. After the liquid-liquid extraction step, the solvent was separated in the rotatory evaporator (at a vacuum of 20 in Hg)/ the residue in the evaporator was transferred into a weighed vial and the amount of oil calculated by weight difference.

Uses:

1. Antiviral Activity
2. Antihypertensive Effect
3. As a good source of vitamin C, onions may support the building and maintenance of collagen. Collagen provides structure to skin and hair.



Fig-3. Onion oil

5.4. Baheda

Bibhitaki is also called baheda, an herb which makes the fellow fearless and this herb is one of the ingredients and among Triphala I.e.haritaki, bibhitaki, and Amalaki. This is very useful in the nutrition of the dhatus of the body and the accession of tridosha. Hair growth and

preventing or hoarseness of voice. They give natural color to the hair (black).

5.5. Chemicals and Reagents

Quercetin, gallic acid, 1, 1-diphenyl-2-picrylhydrazyl (DPPH) and thiobarbituric acid (TBA) were purchased from Sigma-Aldrich, St. Louis, USA. Ascorbic acid, FolinCiocalteu's phenol reagents were the product of E. Merk, Mumbai, India. Nitro blue tetrazolium (NBT), phenazinemethosulphate (PMS), reduced nicotinamide adenine dinucleotide (NADH), potassium ferricyanide, trichloroacetic acid (TCA), ferric chloride (FeCl₃), ferrous sulfate (FeSO₄) and sodium dodecyl sulfate (SDS) were purchased from SRL India. All other reagents and chemicals used were of analytical grade.

5.6. Extraction Process

Twenty grams of the dried and powdered plant sample of T. bellerica fruit pulp seed) and bark was extracted with 70% ethanolic solvent (in distilled water) for an instant at room temperature in an orbital shaker. The extracts were separated from the residues by filtering through Whatman No. 1 filter paper. The residues were extracted until discoloration with the same fresh solvent and extracts combined. The combined extracts were concentrated and freed of solvent under reduced pressure at 40 °C by using a rotary evaporator and lyophilized till dryness. The dried crude concentrated extracts were stored at- 4 °C and used for the antioxidant activity determination and GC-MS analysis

Uses:

- It boosts up hair growth and helps to impart black color to hair.
- The fruit is antibacterial and uses to fight against various infections.
- It is rejuvenating in nature and it is very beneficial for hair growth.
- It is useful in hoarseness of voice and asthma.
- It is also used as an anti-inflammatory



Fig-4. Baheda

6. MECHANISMS

6.1 Mechanism of hair growth by using onion

There are many ways onion extract can benefit from hair damage and loss. For one, onions are high in dietary sulfur, a nutritional element our bodies need. Sulphur is found within amino acids, which are components of protein. Proteins and particularly keratin, which is understood to be sulfur-rich are needed for growing strong hair. When added to the hair and scalp, onion juice can provide extra sulfur to support strong and thick hair, thus preventing hair loss and promoting hair growth. The sulfur from onions may additionally help promote collagen production. Collagen successively helps the assembly of healthy skin cells and hair growth.

6.2. Mechanism of hair setting gel

Hair gel may be a styling product that comes in a traditional gel consistency, liquid consistency, or a sprig. it always comes in several holding strengths, from light to strong, and provides a wetter look than mousse or hairspray. When styling with gel, it is best to use the gel to wet hair and either let your hair air dry or blow it dry with a hairdryer. A gel isn't designed to be used on dry hair. It's also believed that onions may boost circulation. Applying onion juice to the hair and scalp could increase blood supply to hair follicles, which successively improves hair growth

7. METHODOLOGY

7.1. Collection and Authentication of Plant Materials:

The plant specimens for the proposed study *Allium cepa*L., *Terminalia bellerica*L., were collected from the paddy fields and other irrigated fields in and around Dhule District, Maharashtra, India during February. The herbarium of these plants or fruit was identified and authenticated by the Department of Botany, R.C.Patel College of Arts, Commerce, and Science. The plants were dried under the sun.

7.2. Preparation of Plant Extracts:

Onion: The extraction utilized was steam distillation, which was carried out as follows: a weighed amount of ground onions (approximately 1000 g) they dry and placed in a four-liter round bottom flask with two outlets. This container was heated with a heating mantle to 100°C to maintain a homogeneous temperature in the flask during the distillation operation (see Fig. 2). One of the outlets of the container was connected to a steam generator which was simply a container with boiling water; the other outlet of the first container was connected to the condenser, and the condenser was connected to a condensate receiver. The ground onion in the distillation flask was heated to 100°C and the steam was injected into the mixture until 500 ml of condensate was collected. It was determined that no further oil was extracted after 500 ml of condensate was collected. The condensate was then subjected to liquid-liquid extraction with the. Experimental solvent. Again, for solvents partially soluble in water, sodium sulfate was used to separate this contaminant from the oil solution. After the liquid-liquid extraction step, the solvent was separated in the rotatory evaporator (at a vacuum of 20 in Hg)/ the residue in the evaporator was transferred into a weighed vial and the amount of oil calculated by weight difference.

Baheda: Twenty grams of the dried and powdered plant sample of *T. bellerica* fruit pulp seed and bark was extracted with 70% ethanolic solvent (in distilled water) for an instant at room temperature in an orbital shaker. The extracts were separated from the residues by filtering through Whatman No. 1 filter paper. The residues were extracted until discoloration with the same fresh solvent and extracts combined. The combined extracts were concentrated and freed of solvent under reduced pressure at 40 °C by using a rotary evaporator and lyophilized till dryness. The dried

crude concentrated extracts were stored at -4 °C and used for the antioxidant activity determination and GC-MS analysis

7.3 Preparation of Formulation:

The gel formula contains methylparaben, glycerin, polyethylene glycol (PEG), carbopol 934, and triethanolamine. Carbopol 934 two grams and measured quantity of extracts were dispersed in 80 ml of distilled water and mixed by stirring continuously in a magnetic stirrer at 800 rpm for 1 h. Glycerin 3 ml was added to the mixture under continuous stirring. The mixture was neutralized by dropwise addition of 50 % triethanolamine. Mixing was continuous up until a clear gel was formed. Then add onion extract and PEG mixed with a magnetic stirrer at 800 rpm for 1 h.

8. FORMULATION TABLE:

| Ingredient | Quantity |
|----------------------|----------|
| Carbopol 934 | 3gm |
| Methylparaben sodium | 7.5mg |
| Glycerine | 3ml |
| PEG | 3ml |
| Triethanolamine | 1.5ml |
| water | 75ml |
| Onion oil | 5ml |
| Baheda extract | 2ml |

9. EVALUATION:

1. pH: The pH of the gel formulation was determined by using a digital pH meter. 1 gram of gel was taken and add in 100 mL distilled water and measurement of pH

was done in triplicate and the normal value was calculated.

2. Viscosity: Brookfield viscometer was used for the measurement of the viscosity of the prepared gel. The Brookfield viscometer was rotated at 100 rpm, spindle no.6. Each reading was taken after equilibrium was attained by the sample at the end of two minutes. The study was repeated three times and the average value is calculated.

3. Spreadability: It was determined by a wooden block and glass slide apparatus. Weights of about 20 g were added to the pan and the time was noted for the upper slide (movable) to separate from the fixed slides. Spreadability was then calculated by using the formula,

$$S = M.L/T$$

Where, S=Spreadability, M=Weight tide to upper slide, L=Length of a glass slide, T=Time taken to separate the slide from each other. The therapeutic efficacy of a formulation also depends upon its value.

4. Homogeneity: Developed gel was tested for homogeneity by visual inspection after the gel was set in the container. It was tested for the appearance and presence of any aggregates.

5. Skin irritation test: Test for irritation was performed on human volunteers with their consent. 5 volunteers were selected and 1.0 g of the prepared gel was applied on an area of two square inches to the back of the hand. The volunteers were observed for lesions or irritation.

6. Color: The color of the hair setting gel was checked Visually.

7. Odor: The formulation was evaluated for its odor by smelling it

8. Consistency: It was tested Manually

10. Evaluation Parameters

| Sr.no | Parameters | Observations |
|-------|----------------------|------------------------------------|
| 1 | pH | 6.68 |
| 2 | Viscosity | 4731cps |
| 3 | Spreadability | 11.05 (g-cm/sec) |
| 4 | Homogeneity | Homogeneous, smooth and consistent |
| 5 | Skin irritation test | Non-irritant |
| 6 | Color | Blue |
| 7 | Odor | Odorless |
| 8 | Consistency | Semisolid |

11. RESULT

Onion and Beheda extract was prepared by using the distillation process using alcohol as a solvent. It contains chemical constituents like Potassium, Zinc, Gallic acid, Vitamin, Quercetin. It shows the activity of reducing hair loss and Give natural black color to hairs . It also boosts hair growth. formulation and evaluation of hair setting gel by using onion oil, baheda was studied.

12. CONCLUSION

In conclusion, The gel formulation on the hair setting, growth, and length was found to be more significant as compared to the standard. The present work shows the significant results without any side effects.

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