FORMULATION OF NANO-BASED HERBAL HAIR OIL AS NATURAL HAIR COLOURING AGENT FOR THE TREATMENT OF HAIR LOSS AND GREYING OF HAIR.

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Introduction:

Hair loss and graying of hair is become a very serious concern in the present population as a consequence of increased usage of chemical based shampoos and also improper care. As an alternative people want to use herbal products as they have no side effects. The aim of the present study involves preparation of hair oil using the natural ingredients which include *Emblica officinals, Bergera koenigii, Hibiscus rosa-sinensis, Aloe barbadensis miller, Trigonella foenum-graecum L, Salvia rosmarinus spenn, Allium parvum, Cocos nucifera* which are traditionally used for promoting hair growth, nourishing the scalp, preventing hair loss naturally. *Emblica officinals* is rich in vitamin C and minerals, *Bergera koenigii* helps for strengthen hair roots, reduce hair fall, combat dandruff, strengthen follicles etc., *Trigonella foenum-graecum L* seeds are a natural power house of health, it stimulate hair growth., *Aloe barbadensis miller* is versatile natural remedy for hair that deeply conditions and moisture, soothes itchy, dandruff-prone scalps., *Cocos nucifera L* oil is the foremost worthy oil base because it get absorbed into the hair strands better than other oils.

Lawsonia inerms, Eclipta prostrate, Indigofera tinctoria can be used as potential natural hair coloring agent. An active ingredient in *Lawsonia inerms*(henna plants) identified as “lawsone” isan orange-reddish dye that attaches to the protein keratin of human skin to color it., *Eclipta* prostrate (Bhringraj plant) and *Indigofera tinctoria* is preventing premature graying and stimulate hair growth etc. Hair being an important part of human appearance, plays a significant role in self-confidence. Common hair problems such as hair fall, dandruff, premature greying, and scalp infections are increasing due to factors such as pollution, stress, poor nutrition, and excessive use of chemical-based products. Synthetic hair oils and dyes may provide quick results but often lead to side effects such as irritation, dryness, and long-term hair damage. Herbal formulations, including herbal hair oils and herbal hair dyes, are gaining popularity due to their natural, ancient origin, safety, and minimal side effects. This study focuses on the formulation and evaluation of herbal hair oil and herbal hair dye to ensure their effectiveness, stability, and safety. We are also developing nanoformulation for increased efficiency.

Objectives:

1. To Identify plants as natural hair colouring agents.
2. Identification of plant derived dyes and extraction.
3. Application of non-technology in herbal hair care formulation.
4. To evaluate the physicochemical properties (color, odor, pH, viscosity, stability) of the formulations

Methodology:

Preparation of Oil

1. Selection and collection of Herbal samples: the collected samples were *Emblica officinals* fruit powder,*Bergera koenigii* leaves, *Hibiscus rosa-sinensis* leaves and flower, *Aloe barbadensis miller, Trigonella foenum-graecum L seeds, Salvia rosmarinus spenn petals, Allium parvum.*
2. Extraction of phytochemicals from the herbal plant sample: Drying and powdering the collected plant materials were washed with distilled water, shade-dried, and powdered using a grinder. The powdered samples were subjected to extraction using suitable methods such as: Soxhlet, rotary evaporator
3. The powdered herbs samples are mixed into a base oil, such as *Cocos nucifera L(coconut oil)* and heated at a low temperature for 3hours to infuse the oil with active ingredients without destroying their properties.
4. The oil is cooled and filtered through a muslin cloth, filtered helps to separate the debris and obtain clear herbal oil, with the process often repeated with fresh herbs to enhance concentration.
5. Green synthesis of zinc oxide Nano particles: 200ml of aqueous zinc nitrate solution is mixed with 20mlof aqueous leaf extracted subsequently and treated with 0.1M sodium hydroxide. The ions which initiated the reaction were afforded by the zinc nitrate in de-ionized water. The reaction mixture as incubated with constant stirring in the dark at 60 ^{0}C to avoid photo catalysis., observed off white color marked the formation of ZNOPs at the end 24h, Resulting product further purified by centrifugation and washed in double distilled water and ethanol, dried and stored in an amber colored sample bottle until use

Preparation of Dye

1. Preparation of Herbal Hair Dye: the herbs samples were collected from Ayurveda shops in the powdered form. Then all ingredients are mixed uniformly to prepare a homogeneous mixture of a powder form of dye.
2. Evaluation of Herbal Hair Dye: The formulated herbal hair dye was evaluated by using various parameters like organoleptic, Rheological. Organoleptic characteristics for various sensory characters like color, test, odor, texture and appearance have to be identified carefully., Rheological evaluation is used for Particle size is a parameter, affecting various factors such as dispersion, stiffness etc.
3. Stability study- Stability of the prepared formulation was determined by keeping the formulation at different temperature conditions for the period of time for one month The packed formulation were stored at different temperature conditions. At room temperature and 35°C and were evaluated for physical parameters. The prepared dye formulation was evaluated for the physical parameters like color, odour, texture and smoothness.

4. Patch test- A small quantity of paste was applied on the ear back. After 20 minutes this paste was removed and the area was washed carefully. There was no irritation and allergic reactions were seen.

Result and Conclusion:

The hair oil serves as a superior, non-toxic, and effective natural alternative to synthetic dyes, successfully managing hair loss and reversing premature greying by providing deeper scalp penetration and long-lasting nourishment. The combination of traditional herbs and nanotechnology creates a synergistic effect that actively promotes hair growth, prevents hair loss, and acts as an effective natural colouring agent. The use of nanotechnology ensures that vital nutrients from herbs are better absorbed, thus offering superior nutrition for the hair follicles and scalp, leading to healthier and darker hair. Enhances the bioavailability of herbal constituents like Fenugreek and Bhringraj, leading to faster hair regrowth and a sustained colorant effect. Herbal hair oil represents a sustainable and therapeutically effective cosmetic product that offers both aesthetic improvement (colouring) and therapeutic care (hair loss treatment) without side effects. Nano formulation can be more efficient and long lasting.

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Future Scope:

1. This formulation successfully addresses the multifaceted issues of hair greying and loss, making it a promising product for the, cosmetic market.
2. It developing a safe and natural alternative to chemical hair dyes using herbal ingredients it involves evaluation of different dye combination for effectiveness and safety there dye function to colour hair nourish it, and protect the scalp without causing damage
3. The herbal dye formulation and evolution of herbal hair dye this providing a semi – permanent colour that coats the hair shaft. The dye acts as a hair growth stimulant and anti – dandruff agent clinical evaluation and including patch and stability tests confirmed the formulation is safe
4. Explore novel extraction techniques and incorporation of additional bioactive compound for better hair growth and scalp health there is also scope for incorporating modern drug delivery system such as Nano formulation to improve absorption and effectiveness