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PREPARATION AND EVAULATION OF POLY HERBAL HAIR OIL BY USING *LINUM USITATISSIMUM*

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ABSTRACT

India is known for traditional medicine. Herbs are the traditional form of Indian medicine which was developed by ancient sages whose astute observations led to the development of constitutional medicine. Herbal cosmetics are the preparations used to enhance the human appearance The aim of the present research was to formulate and evaluate the herbal oil of flaxseed for the purpose of moisturizing and nourishing the hair. Flaxseed, rich in α linolenic acid, lignans, and fiber, improves circulation and promotes hair growth. Flaxseed (linseed) is full of fatty-acids and anti-oxidants which help to remove toxins and dead cells from the scalp. Demand for cosmetics increases day by day & numerous people use Them regularly. Herbal cosmetics are substantially used because they've Lower negative effect & give further safe loss problem find the ways to Increase have development & help have loss. Hair serum, gel or oil Humidity the skin and stimulate the growth of new hair more as Compared to old. Flaxseed oil is created from various formulation by using flax seeds. The flaxseed oil contains several beneficial active substances, including Omega-3 fatty acids Important minerals, including magnesium and calcium. Vegetable fiber which helps prevent gastrointestinal issues and constipation. Lignans, which are phenolic compounds that may prevent the risk for cancer. B. proteins that can reduce the risk for cardiovascular disease. Human hair growth is very important to our health and well-being. Curry leaves and other herbal Ingredients are known for their potential as hair growth stimulants and conditioners. These products Address hair-related issues like hair loss, thinning, split ends, dandruff, increased sebum production, And hair loss. Hair conditioners boost bounce, nourish hair, maintain scalp cleanliness, and add shine.

KEYWORDS: linum ussitatissimum.

INTRODUCTION

Herb can be defined as, "any plant which has leaves, stem, flowers, roots and seeds; used for different purposes like flavoring, food, medicine or perfume". Botanically, herb is any seed-bearing plant which does not have a woody stem and dies down to the ground after flowering or completion of life cycle. Means herbs are seasonal plants. According to Oxford Dictionary, "herb is any plant with leaves, seeds or flowers used for flavoring, food, medicine or perfume". Plants used as spice, aromatic and food are also considered as herb in day-to-day life.

HERBAL COSMETICS

Introduction to Herbal Cosmetics.

Cosmetics

According to C and D Act 1940: Any article intended to be rubbed, poured, sprinkled, sprayed on or introduced or applied to any part of human body for cleansing, beautifying, promoting attractiveness or altering the appearance and includes any article intended for use as a component of cosmetics.

Herbal Cosmetics
Herbal cosmetics is defined as the Beauty products, which possess desirable physiology activities, such as skin healing, smoothening, appearances, enhancing, and conditioning properties with the help of herbal ingredients.

Herbal cosmetics, derived from the Greek term for organization and embellishment, are made from various herbs and include products for

- Hair care (shampoos, dyes, oils)
- Skin care (lotions, washes, toners, face packs)
- Oral care (toothpaste, tooth powders)
- Nail care (nail treatments)
- Eye care (kajal, eye drops)

Classification of Herbal Cosmetics
Herbal cosmetics can be classified in two primary ways: by their application (body part) and by their physical form (dosage form).

A. Hair Care
These products target the scalp and hair follicles.

- **Hair Oils:** For growth and scalp health.
- **Herbs:** Amla (Vitamin C/strength), Bhringraj (hair growth), Brahmi (calming).
- **Cleansers (Shampoos):** Preparations of surfactants in liquid, powder, or solid form used to remove surface grease and dirt, and skin debris from the hair shaft and scalp without adversely affecting the hair, scalp or health of the users
- **Herbs used:** shikakai (natural cleansers) Reetha (soapnut /foaming agent) Conditioners and Colorants
- **Herbs used:** Henna (conditioning and dye), Hibiscus (softening), Indigo (natural black dye)

HAIR
Hair is one of the characteristics features of mammals and has various function such as protection against external factors i.e. heat, cold, etc. Hair is one of the important parts of body considered to be protective appendages on the body and Accessory structure of the Zintegument along with Sebaceous gland and sweat gland.

Structure of hair
Hair consists of two parts:

Hair Follicle[5,67]
The Follicle is a structure in the skin that resembles a club. There can be a network of blood vessels at the top of the follicle that supply nutrients to nourish and promote hair growth. We refer to this as the papilla. Every follicle is the result of a communication between the dermis and epidermis. The follicle is segmented into three parts:

1. **Infundibulum**
2. **Isthmus**
3. **Inferior segment**

Hair Shaft
The hair shaft is divided into three layers.

1. Medulla: The medulla is the center section of hair. It will either be continuous or doubled, or it will be divided or segmented. They are often packed with cells or resemble a hollow tube. The medulla is absent from the majority of hairs, s, but it might be broken or discontinuous in others. It creates the hair shaft's midsection. Particularly fine hairs typically lack this layer.

2. Cortex: The greatest portion of the hair shaft, or melanin (hair pigment), is what gives hair its colour.

3. Cuticle: The hair shaft's transparent outer coat may be called the cuticle. It is constructed from overlapping scales that shield the hair's inner layers. The hair's proximal end, which is closest to the scalp, and distal end are where the scales point.

Hair types
Hair type is primarily based on the curl pattern of the hair, which is determined by the hair follicle. Genetics play a key role in determining hair type. Andre Walker, who has been Oprah Winfrey's stylist for decades, is credited with creating a system that classifies hair into one of four curl patterns

- Type 1: Straight
- Type 2: Wavy
- Type 3: Curly
- Type 4: Coily

1.3. HAIR GROWTH CYCLE[4]
Hair growth cycle consists of 3 stages

1. Anagen stage (Growth)
2. Catagen stage (Transition)
3. Telogen stage (Rest)

1. Anagen phase
The anagen phase is the growth phase of the hair. The Anagen phase will last from Between 2-6 years. A new hair pushes the new hair that stopped growing up and out of the follicle.

2. Catagen phase
The catagen phase is a transitional stage and 3% of all hairs are in this phase at any given time. This phase lasts for 2-3 weeks.

3. Telogen phase
The telogen phase is the resting phase which lasts for about 2-3 months. During the telogen phase, the hair follicle is at rest and the Club hair is completely formed.

HAIR OIL
Hair care products include hair oil. Hair care products are characterized as compositions intended to cleanse, alter the texture of hair, nourish the hair, and preserve the appearance of healthy hair.[11] Hair oils are hair care

products that are used to the hair to address conditions like baldness, graying hair, hair loss, and dry hair. They also aid in nourishing the hair.[12] Due to the growing interest in herbal cosmetics among people, as well as the fact that their ingredients are readily available and their effectiveness is greater than s greater than that of their synthetic counterparts, herbal cosmetics are in high demand.[13] A crucial component of herbal cosmetics is herbal hair oil. Herbal hair oil is increasingly widely utilized and preferred for many hair conditions.[14] The use of hair oil is growing daily in tandem with people's rising standards of living. Herbal essences and scents are added to hair oil to give it natural flavors and colors.

Different types of herbal hair oil available in market

a. Amla hair oil
b. Coconut hair oil
c. bhringraj hair oil

Hair oil Benefit

Their benefits are as follow: It provides natural goodness to hair. Herbal oil contains vitamins and micro nutrients which acts as a food for hair Hair oil helps in preventing hair loss and fames frizzy hair. Hair ends need special care and herbal oil pampers them throughout their nourishment. Regular use of hair oil of hair oils cure problem of premature grey hair.

i. Keeps the scalp hydrated
ii. Improves hair growth
iii. Prevents dandruff

Plant Profiles Flaxseeds

Synonyms: Linseed, Common flax
Biological Source: Flaxseeds are the dried ripe seeds of Linum usitatissimum Linn. an annual herb in the Linaceae family,
Family: Linaceae **Chemical Constituents** Flaxseeds contain

- Omega-3 fatty acids (α-linolenic acid)
- Lignans (secoisolariciresinol di glucoside – SDG)
- Proteins
- Mucilage
- Fixed oil

Uses of Flaxseeds

- Used in herbal hair oils and hair gels for nourishment
- Promotes hair strength and shine
- Used in dietary supplements and functional foods
- Natural hair conditioning and styling gel

Coconut oil Synonym: Cocos nucifera Linn.
Family: Arecaceae (Palmae)
Biological Source: Coconut oil is obtained from the dried kernel (copra) of the fruits of Cocos nucifera Linn.
Chemical Constituents: Coconut oil is obtained from the dried kernel of Cocos nucifera. It mainly contains saturated fatty acids such as lauric acid, myristic acid, palmitic acid. It is widely used in hair oils due to its moisturizing and antimicrobial

Uses

- Used as hair oil and skin moisturizer
- Employed as a base oil in herbal preparations
- Possesses antimicrobial and anti- inflammatory properties

Henna

Botanical Name: Lawsonia inermis Linn.
Family: Lythraceae
Synonyms: Lawsonia alba, Lawsonia spinosa
Biological Source: Henna powder consists of the dried leaves of Lawsonia inermis, which are finely powdered after shade drying.
Chemical Constituents: The leaves of Laws onia inermis contain lawsone (2-hydroxy-1,4-naphthoquinone) as the chief coloring principle. They also contain tannins, flavonoids, phenolic compounds, coumarins.

Uses

- Natural hair dye and conditioner
- Used to strengthen hair, reduce dandruff
- Cooling agent for scalp

Amla

Synonyms: Amalaki, Emblic myrobalan, Amla / Indian Gooseberry
Biological Source: Amla powder is obtained from the dried fruits of Phyllanthus emblica Linn. (Synonym: Emblica officinalis Gaertn.)
Family: Phyllanthaceae
Chemical Constituents: The fruits of Phyllanthus embolic contain Vitamin C (ascorbic acid) as the chief constituent. They also contain tannins (Emblicanin A & B), flavonoids, and pectin. Vitamin C and tannins are response for its antioxidant property.

Uses

- Widely used in herbal hair oils and hair packs.
- Prevents hair fall and premature greying.
- Strengthens hair roots and improves shine.

Curry leaves

Synonyms: Curry leaves, sweet neem, Curry leaf tree
Biological Source: Curry leaves consist of the fresh or dried leaves of Murraya koenigii (L.) Spreng.
Family: Rutaceae
Chemical Constituents: Curry leaves (Murray konini) contain important chemical constituents' flavonoids, terpenoids, tannins, saponins, essential oils, and vitamins (A, C). These compounds are responsible for their medicinal properties.

Uses

- Widely used as a culinary flavoring agent
- Ingredient in herbal hair oils to prevent premature greying and hair fall

Hibiscus rosa-sinensis Synonyms: China rose, Shoe flower

Biological Source: Hibiscus consists of the fresh or dried flowers and leaves of Hibiscus rosa-sinensis Linn.
Family: Malvaceae
Chemical Constituents: Hibiscus is obtained from the flowers of Hibiscus rosa-sinensis.
It contains flavonoids, mucilage, tannins. It is used in hair oils for promoting hair growth and preventing hair.

Uses of Hibiscus
- Widely used in herbal hair oils, shampoos, and conditioners
- Used in traditional medicine for skin and hair disorders

Aloe vera Synonyms: Aloe barbadense, Kumari
Biological Source: Dried juice (latex) collected from the leaves of Aloe vera plant.
Family: Asphodelaceae (formerly Liliaceae)
Chemical Constituents: Aloe vera is obtained from the leaves of Aloe vera. It contains glycosides, saponins, vitamins (A, C, E). It is used for its moisturizing, soothing, and hair growth–promoting properties.

Uses of Aloe Vera
- Skin creams & gels
- Hair oils & shampoos
- Treatment of constipation

METHOD OF PREPARATION
Extraction
Extraction refers to the presence for the isolation of the active form of drug material. This may be done by physical means or by dissolving in a suitable menstruum (liquid solvent). Extraction is physical act of applying pressure to squeeze out oils or juices from plants.

Methods of extraction
- Maceration
- Infusion
- Digestion
- Percolation
- Continuous hot extraction
- Super critical fluid extraction
- Microwave assisted extraction
- Ultra sonication assisted extraction

Procedure
1. All herbal powders such as henna, neem, curry leaves, hibiscus, and amla were passed through a sieve to obtain uniform particle size; flaxseeds were coarsely crushed using a mortar and pestle, and aloe vera gel was cleaned and kept free from fibers.
2. Coconut oil (360 ml) was taken in a clean, dry, wide-mouthed glass or stainless-steel container to serve as the base oil for maceration.
3. The sieved herbal powders and crushed flaxseeds were slowly added to the coconut oil with continuous stirring to ensure uniform dispersion of the plant materials.
4. Aloe vera gel (20 g) was added gradually to the mixture and mixed thoroughly to form a homogeneous mass.
5. The container was tightly closed with a lid and kept at room temperature in a dark place for 7–10 days to allow maceration of the herbal ingredients in the oil.
6. During the maceration period, the mixture was stirred or shaken gently once daily to enhance the extraction of active constituents from the herbs into the oil.
7. After completion of the maceration period, the mixture was subjected to mild heating on a water bath at 40–50°C for 10–15 minutes to improve extraction and remove residual moisture, avoiding overheating.
8. The oil was then allowed to cool naturally at room temperature.
9. The cooled mixture was filtered through a clean muslin cloth or filter paper to separate the oil from the herbal residues, and the marc was pressed to obtain maximum yield of oil.
10. The final volume of the oil was adjusted to 500 ml by adding coconut oil if required.
11. The prepared herbal hair oil was transferred into a clean, dry, and well-labeled container for storage and further use.

Formulation
1) Coconut oil - 360 ml
2) Henna powder - 20 gm
3) Neem powder - 20 gm
4) Curry powder - 20 gm
5) Hibiscus powder - 20 gm
6) Aloevera gel - 20 gm
7) Amla powder - 20gm
8) Flaxseeds - 20 gm Total - 500ml

Preparation of flaxseeds Extract:
1. 30 g of powdered flaxseeds (Linum usitatissimum) were taken in a clean container.
2. The powder was mixed with 150 ml of suitable solvent (ethanol / isopropyl alcohol).
3. The mixture was kept for maceration with occasional shaking for 3–7 days.
4. The extract was filtered to obtain the supernatant liquid and stored for further analysis

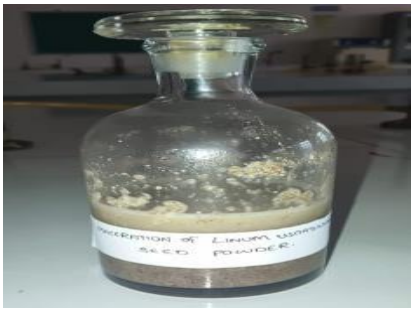

Fig. No-1 flaxseeds Extract PHYSICOCHEMICAL STUDY.

Organoleptic Characteristics

- **Colour Process**

Take a small quantity of hair oil in a clean glass container and observe visually in daylight.
Result: Greenish brown colour.

- **Odour Process**

Smell the sample carefully.
Result: Pleasant characteristic herbal odour.

- **Appearance Process**

Observe clarity and presence of suspended particles.
Result: Smooth and clear oil.

1. Determination of pH

- Take 1 ml of hair oil in a beaker.
- Add 10 ml distilled water and shake well.
- Measure pH using a digital pH meter.
- pH found between 5–6, suitable for scalp application.

Fig. No-2 Determination of Ph.

2. Acid Value Process

- Take known weight of oil sample.
- Add neutralized alcohol.
- Titrate with 0.1N KOH using phenolphthalein indicator. It forms a pale pink color.

Formula
Acid value = (56.1 × N × V) / W
Result: Found within acceptable limit.

Fig.No-3 Determination of Acid Value.

3. Saponification Value Process

- Take 2g of oil.
- Add alcoholic KOH and reflux for 30 min.
- Titrate excess KOH with HCl using phenolphthalein. It forms a pale pink color to color less. It Indicates normal fatty acid content.

Fig. No-4 Saponification Value.

PHYTOCHEMICAL STUDYIES

A quantitative phytochemical test to detect the presence of carbohydrates, Proteins, Fixed oils, Saponins, Flavonoids, Saponins.

Test for Carbohydrates: To the extract, few drops of Alpha naphthol and concentrate H2SO4 was added from the walls of the test tube. Formation of violet colour ring at the junction of two layers indicates the presence of carbohydrates.

Fig.No-5 Test for Carbohydrates.

Test for proteins: add 1–2 ml of the sample extract of flaxseed polyherbal hair oil taken in a clean test tube. To this, a few drops of freshly prepared 0.2% ninhydrin solution are added and the mixture is shaken gently. The test tube is then heated in a water bath for about one to two minutes and allowed to cool. The development of a blue or violet color indicates the presence of proteins or amino acids in the sample. The appearance of this color confirms a positive result for proteins in the flaxseed polyherbal hair oil.

Test for Fixed oils

The fixed oil test was performed to confirm the presence of fixed oil in the flaxseed poly-herbal hair oil containing Linum usitatissimum. A few drops of the prepared hair oil were placed on a clean filter paper and allowed to dry at room temperature. After drying, the filter paper was observed for the formation of a permanent translucent greasy spot. The presence of a permanent greasy stain on the filter paper indicated the presence of fixed oil. Since flaxseed is rich in fixed oils, the test showed a positive result.

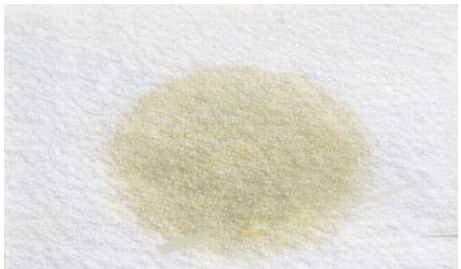

Fig.No-22 Tet for Fixed oils.

Test for Flavonoids

About 1 mL of the oil extract was taken in a test tube, and a small piece of magnesium ribbon was added, followed by the addition of a few drops of concentrated hydrochloric acid. The mixture was shaken gently and observed for color change. The appearance of a pink to red color indicated the presence of flavonoids. The test showed a positive result, confirming the presence of flavonoids in the prepared poly- herbal hair oil.

Fig.No-23 Test for Flavonoids.

Test for Saponins: Taking 1g of sample extract and diluting it with distilled water in a test tube. The mixture was shaken vigorously for a few minutes and allowed to stand. Formation of a stable and persistent froth (foam) for about 10– 15 minutes indicated the presence of saponins. The test showed a positive result, confirming the presence of saponins in the prepared poly- herbal hair oil.

Fig. No-24 Test for Saponins.

Test for Tannins: Adding a few drops of 5% ferric chloride solution to 1 mL of the flaxseed poly-herbal hair oil extract. The mixture was shaken gently and observed for color change. The appearance of blue-black or greenish-black color indicated the presence of tannins. The test showed a positive result, confirming tannins.

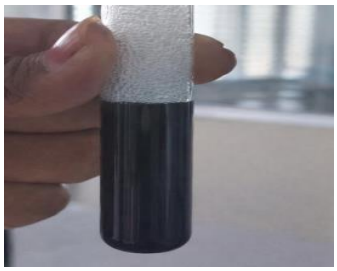

Fig. No-25 Test for Tannins Stability Studies.

Test for Skin Irritation: Select a small external area of skin (inner forearm). Clean the area properly and allow it to dry and apply a small quantity of the prepared hair oil directly on the skin surface. Gently spread it over the area. Leave it exposed for 24 hours. Observe the area for redness, itching, swelling, rashes, or burning sensation.

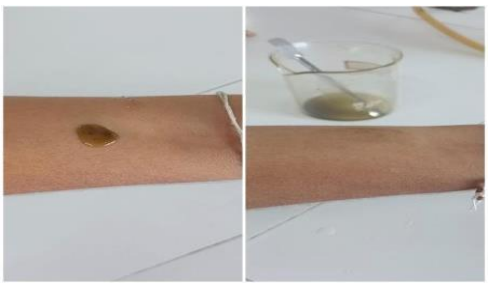

Fig. No-26 Test for Skin irritation.

Anti-microbial activity by cup plate method
Principle
The cup plate method is used to check antimicrobial activity. If the hair oil has antibacterial activity, it will produce a zone of inhibition (clear area) around the well in agar plate inoculated with E. coli.

A. **Preparation of test solution:**1 mL of flaxseed poly herbal hair oil was diluted with 9 mL of sterile DMS to obtain a 10% v/v solution. The solution was mixed well and used for antimicrobial activity by cup plate method.

B. Preparation of standard solution: 10 mg of Gentamicin was dissolved in 10 mL sterile distilled water to prepare 1 mg/mL standard solution. It was used as the reference standard for antimicrobial activity.

C. Test organisms

Fig. No 11 *E. coli* Gram (-ve) bacteria.

D. Preparation of media

Peptone water media was prepared using following ingredients:

1. Beef extract -2g
2. Peptone-2g
3. Sodium chloride -1g
4. Agar-4g
5. Distilled water -Q. S to 100ml.

The above shown quantities of different ingredients were accurately weighed and dissolved in100ml distilled water. 50ml of the media was distributed into 2 conical flasks.

Media was Prepared and then sterilized by autoclaving at 15Lbs/sq., inch for 15 minutes.

E. Preparation of inoculum

The peptone water medium was sterilized by autoclaving at 15Lb/sq. inch for 15 min Loop full organisms were transferred from a laboratory-maintained culture into a Petri plate with sterilized peptone water medium. The Petri plate was then inoculated for 24hours at 37°c.

F. Sterilization of apparatus required

Petri dishes, cork, borer (8mm), glass syringes and test tubes were sterilized by autoclaving at 15Lbs/sq. inch for 15 minutes.

G. Procedure for Microbial assay

Sterile nutrient agar medium was prepared and inoculated with the selected test organism such as E. coli. About 20 ml of the inoculated medium was poured into sterile Petri plates and allowed to solidify at room temperature. After solidification, wells of approximately 8 mm diameter were made in the agar using a sterile cork borer. Different concentrations of the flaxseed poly herbal hair oil were carefully introduced into the wells under aseptic conditions.

Distilled water was used as control. The plates were kept in a refrigerator for 1–2 hours to allow proper diffusion of the sample into the agar medium. Later, the plates were incubated at 37°C for 24 hours. After incubation, the zones of inhibition were observed and measured in millimeters, and the antimicrobial activity of the formulation was evaluated by comparing it with the control.

RESULT AND DISCUSSION

Various Physicochemical studies, phytochemical studies, Stability studies for *linum usitatissimum* poly herbal hair oil and Anti-microbial activity *linum usitatissimum* poly herbal hair oil were studied.

Table-1: Physicochemical studies from *linum usitatissimum* poly herbal hair oil.

S. No	Name of the Test	Normal Value	Observation
1	pH Value	4.5-6.5	5.05 (+)
2	Acid value	1-5	4.2 (+)
3	nification value	180-200	182 (+)

- **(+)** present
- **(-)** absent

Table-2: phytochemical studies from *linum usitatissimum* poly herbal hair oil.

S. No	Constituents	Observation
1	Carbohydrates	+
2	Proteins	+
3	Fixed oil	+
4	Flavonoids	+
5	Saponins	+
6	Alkaloids	-

- **[+]** present
- **[-]** absent

Table -3: Stability studies from *linum usitatissimum* poly herbal hair oil.

S. No	Name of the Test	Observation
1	Skin irritation test	-
2	Spreadability test	+

- **(+)** present
- **(-)** absent

Table-4: Anti-microbial activity of *linum usitatissimum* poly herbal hair oil.

S. No.	MICR O ORGA NISM	ZONE OF INHIBITION		
		LINUM USITATISS IMUM		GENTA MYCIN E
1	E. coli	150 mg/ ml (T1)	250 mg/ ml (T2)	Standard
		8mm	11m m	15mm

- T1-150mg/ml concentration
- T2-250mg/ml concentrate

Fig. no-12 Zone of inhibition of E. coli.

CONCLUSION

The poly herbal hair oil using Linum usitatissimum was formulated and evaluated successfully. The oil was prepared using flaxseed and other herbal ingredients in a suitable base oil by heating or maceration method. The prepared formulation was evaluated for physicochemical parameters such as pH, acid value, saponification value, viscosity, spreadability, and phytochemical screening.

The results showed acceptable quality and stability of the formulation. Due to the presence of omega-3 fatty acids and antioxidants, the hair oil may help in nourishing the scalp and promoting healthy hair growth.

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