

Formulation and Evaluation of Flaxseed Mucilage Based Hair Gel

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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 gel of flaxseed for the purpose of moisturizing and nourishing the hair. Flaxseed (also known as linseed) is full of fatty-acids and anti-oxidants which help to remove toxins and dead cells from the scalp. Three different types of gel formulations containing carbopol 934 in varying concentrations ranging from 1.1gm to 1.3gm % were prepared and evaluated. The evaluation of all the formulations (F1 to F3) were done on various parameters like physical appearance, pH spreadibility, homogeneity, and washability. Among the three formulation, F2 showed good spreadibility, consistency, homogeneity, appearance, pH and There is furthe scope to carryout animal studies also.

Keywords: Aqueous extract, carbopol, Flaxseed, Hair Gel and Herbal

I. INTRODUCTION

Herbal medicine is a type of medicine that uses stems, leaves, seeds, flowers, roots of plants to improve the health, prevent from the disease and treat illness. Herbal medicine is obtaining from natural plants and used in treatment of various diseases. Herbal medicine is a plant-based product that shows nutritive, curative, preventive, efficacious properties. Herbal medicine is an ancient branch of ayurveda as it includes all fields of herbal medicine related to botany, medicinal plant research, pharmacognosy, phytochemistry, botanical medicines, ayurveda, agriculture science, unani medicine, chemical science, biotechnology, and biochemistry. A person who can deals with herbs or medicinal herbs, is called as herbalist. Herbal drug is natural plant product which usually do not produces dangerous harms to human health and it derived from natural origin so it is used in higher amount in day-to-day life. Herbal products are likely to become an important alternative to standard medical therapies. With increasing, safety, efficacy of herbal medicine so it can be easily available for marketing in all over the world Flaxseed is as an important functional food ingredient, because of its rich contents of α -linolenic acid (ALA), omega-3 fatty acid, fiber and lignans. Alpha linoleic acid is another type of omega-3 fatty acid found in plants. Alpha- linolenic acid is known to reduce hyperpigmentation and inhibit melanin production.

Alpha linoleic acid shows anti-inflammatory property and it provides nourishment and nutrients to scalp. In flaxseed oil, flax and fibers lignans have shown potential health benefits such as in reduction of cardiac disease, atherosclerosis, diabetes, cancer, arthritis, osteoporosis, autoimmune and neurological disorders. Apart from this, flaxseed is full of fatty acids and anti- oxidants which help to remove toxins and dead cells from the scalp. Antioxidant produces by flaxseed is lignans. Lignans may help to suppress or inhibit other bacterial growth and also help to prevent cancer. Flax seed gel can be applied to scalp and hair as moisturizer that can help to stimulate hair growth and improve the strength of hair. Flaxseed benefits for skin and hair include strengthening the origins of hair which reduce hair fall. Flaxseed is act as antioxidant which can help to remove toxins and dead cells from the scalp. The flaxseeds produce a vegetable oil known as linseed oil. Flaxseed hair gel is natural herbal product which is help in nourishing the hair and shows anti-dandruff and hair growing effect. Flaxseed hair gel is made by simple boiling procedure, so it is less in cost and easy to



handle. Flaxseed hair gel eliminates a dandruff Flaxseed (also known as linseed) is emerging as an important functional food ingredient because of its rich contents of α -linolenic acid (ALA, omega-3 fatty acid), lignans, and fiber Flaxseed oil, fibers and flax lignans have potential health benefits such as in reduction of cardiovascular disease, atherosclerosis, diabetes, cancer, arthritis, osteoporosis, autoimmune and neurological disorders. Apart from this, flaxseed is full of fatty-acids and anti-oxidants which help to remove toxins and dead cells from the scalp. Flax seed gel can be applied to scalp and hair as a moisturizer that can help to stimulate growth And improve the strength of existing hair. Topical formulations include oils, creams, Ointments, pastes and gels out of which gels Are getting more popular now a days because They are more stable and also can provide Controlled release than other semisolid Preparations. The gel formulations can provide Better absorption characteristics and hence The bioavailability of drug Gels are semisolid Systems in which a liquid phase is constrained Within a three dimensional polymeric matrix (consisting of natural or synthetic gums) in Which a high degree of physical or chemical cross-linking has been introduced Gels are Relatively newer class of dosage forms created By entrapment of larger amount of aqueous Hydro alcoholic liquids in a network of colloidal Solid particles which may consist of inorganic Substance such as aluminium salts or organic Polymers of natural or synthetic origins Most Topical gels are prepared with organic Polymers, such as carbopol 934, which impart An aesthetically pleasing, clear sparkling Appearance to the products and are usually Washed of skin with water. In the present study, flaxseed gel was Prepared by incorporating aqueous extract of Flaxseed into carbopol 934 gel which makes The application of flaxseed extract easy.

Introduction to Flaxseed :-

Biological source :- The drug consists of the dried, ripe seed of *Linum usitatissimum* Linn. The oil can be obtained by cold expression and belonging to the Family: Linaceae

Phytochemistry :- It consists of fixed oil (30–40%), linamarin which is a cyanogenetic glycoside, protein (25%), mucilage (6–10%) and a modest quantity of chemical lipase. The following starches present as raffinose, sucrose, cellulose. Linamarin is glucose both of $(CH_3)_2CO$ cyanohydrin and is indistinguishable. The adhesive can be fractionated into an unbiased division a ramified, arabinoxylan made out of L-arabinose, D-glucose, D-xylose, and D-galactose; and an acidic portion for the most part composed of D-galactose and L-rhamnose. Adhesive swells with water and structures red shading with ruthenium red. Linamarin on hydrolysis yields $(CH_3)_2CO$, hydrocyanic acid, and glucose. This is a rich wellspring of the different phytoconstituents, for example, omega-3 unsaturated fat, α -linolenic acid, lignans, lignin, secoisolariciresinol, ferulic acid, caffeic acid, di-glucoside, p-coumaric acid, top-notch proteins, fibre, phenolic acids, flavonoids, nutrients, different mineral, phenylpropanoids, cyanogenetic glycosides and tannins. Unripe seeds consist of starch, which is, after maturation, changed over to adhesive. Different constituents are phytin, lecithin, wax, gum, colors, malic acid, cyanogenic glycosides linustatin neolinustatin, and secoisolariciresinol and phenylpropanoid glucoside linusitamarin.

On hydrolysis, Linseed oil produces unsaturated acids like linolenic acid (30–half), linoleic acid (23–24%), oleic acid (10–18%) along with immersed acids-myristic, stearic, and palmitic (5–11%). α -linolenic acid (ALA), lignans, n-3 unsaturated fats. Flaxseed contains fixed oil (30-45 percent); linolenic, linoleic, oleic, stearic, palmitic, and myristic acid triglycerides; proteins (20-25 percent); adhesive (3-10 percent), made of unbiased and acidic polysaccharides that produce galactose (8-10 percent), arabinose (9-12 percent), rhamnose (13-29 percent), xylose (25-27 percent), and galacturonic and mannuronic acid (approx. 30 percent); sterols and triterpenes (cholesterol, campesterol, stigmasterol, and sitosterol); cyanogenic glycosides (0.1–1.5 percent) after hydrolysis; linustatin and neolinustatin, for the most part, and the monoglycosides linamarin and linamarin and lotaustralin; and glycoside secoisolariciresinol (precursor of lignans in well-developed animals). The clinical properties of flax are on a fundamental level connected to the seed. Revisions have credited particular restorative properties to unsaturated fats (basically ALA and linoleic acid), lignans (fantastically secoisolariciresinol glucoside), and no starch polysaccharides (i.e., gum, fibre). Flax conveys a seed that contains 38 percent to 45 percent oil. Something else, called Linseed oil, is attained by crushing and compressing the seeds. The oil is made out of around 70 percent polyunsaturated unsaturated fats, with linolenic, linoleic and oleic acids; generally, 18 percent monounsaturated unsaturated fats; and generally, 9 percent drenched unsaturated fats. Flaxseed oil is amongst the finest ordinary wellsprings of ALA, an omega-3 unsaturated fat. Linoleic acid, a rich



wellspring of omega-6 unsaturated fat, and ALA are essential for the fundamental design of cell layers. ALA is a predecessor to the more drawn out and logically unsaturated omega-3 unsaturated fats eicosapentaenoic corrosive (EPA) and docosahexaenoic acid; in any case, just an unobtrusive measure of ALA gives off an impression of being changed over to long-chain unsaturated fats in the human body. Entire or pulveri-ed linseed is a rich foundation of lignans (frequently named phytoestrogens), counting secoisolariciresinol and matairesinol. These lignans are acknowledged to apply cell fortification and phytoestrogenic impacts. They are changed over by tiny life forms in the colon to the dynamic breakdown product as enterodiols and enterolactone. These breakdown products are represented to have more noticeable disease anticipation operator activity than the parent lignan secoisolariciresinol diglucoside and besides apply either delicate estrogenic or antiestrogenic sway, contingent upon organic degrees of estradiol. Entire or pulveri-ed flaxseed is a basis of dissolvable fibre adhesive, additionally found in different individuals from the class *Linum*. Polysaccharides containing D-xylose, L-rhamnose, L-galactose, arabinose, D-galacturonic, and mannuronic acids, fucose, and glucuronic acid are protected by this gum-like content. Flaxseed can contain phenylpropanoids (e.g., p-coumaric corrosive, o-coumaric corrosive, linositamarin), niacin, folic corrosive, tocopherol, potassium, and phosphorus) in the same way, giving about 28 percent of total dietary fibre per 100 g of dry weight. The supplement structure of the 3 types of flaxseed varies. Not in any way like whole and ground flaxseed, flaxseed oil is without fibre and lignans. Flax leaves and seed squander contain the cyanogenic glycosides (checking linamarin, linustatin, and neolinustatin); be that as it may, warming seems to crush these constituents.



Fig 1. Flaxseed

Pharmacological Activity:- These mixes give bioactive incentive to the soundness of animal and people through their mitigating activity, hostile to oxidative limit, lipid regulating, antimicrobial properties, numerous kinds of malignant growth, diabetes, cardiovascular illnesses, cerebrovascular stroke, antimalarial, against weight, gastrointestinal wellbeing, mental health, hormonal status in menopausal ladies, atherosclerosis, joint inflammation, osteoporosis, antiestrogen, immune system and neurological issue. The utilitarian fixings like omega-3 unsaturated fats, dietary fibre, and lignans present in linseed assume a vital job in bringing down lipid and sugar levels. It was accounted for that serum triglyceride, complete cholesterol and the LDL and HDL cholesterol proportion were fundamentally lower in rodents took care of 40 percent linseed, contrasted with control. linseed oil with sesame actuated fundamentally higher tocopherol fixations in plasma and liver [45z. It is a utilitarian food source because of its high dietary fibre and α -linolenic acid substance [46z. Studies have announced that devouring flaxseed feast [47z or its gum [48z forestalls stoutness and improves lipid digestion liable for ensuring the plants employing their antibacterial, antiviral, antifungal activities

Antioxidant Activity:- The cancer prevention agent movement of flaxseed separates has been dictated by free radical rummaging action utili- ing the DPPH strategy. The lignan secoisolariciresinol diglucoside has appeared to have cancer prevention agent qualities [52, 58, 59z. The clinical noteworthiness of the properties of lignan or flaxseed has not been built up



Anticoagulant Activity:- Secoisolarciresinol diglucoside, connected with anti-inflammatory activity, seemed to go about as an adversary of platelet-impellin

variable [58, 62, 63]. While hypothetical parts of the movement and epidemiological data highlight a potential platelet suppressing the response of ALA, human examinations have not exhibited a reliable antiplatelet response.

Appetizer:- Flaxseed eating fibre may add to a vibe of satiety and totality.

Attention Deficit Hyperactivity Disorder:- This is generally connected with diminished blood omega-3 unsaturated fat levels [67]. A pilot study assessed the response of ALA-rich ingestion with flax oil and malignant growth counteraction operator emulsion on blood unsaturated fat structure and led in adolescents with ADHD. After ingestion, levels of RBCs unsaturated fats were higher than pre-treatment and control levels. An up-gradation in appearances was mirrored by a decline in the hard and fast hyperactivity count of ADHD youngsters.

Bipolar Disorder:- Notwithstanding hypothetical assistance and evidence indicating that omega-3 oil is valuable, Babu US, 2000 the effects of flaxseed oil supplementation didn't differentiate from those of phony treatment in either bipolar depression or mania in an experimental report.

Constipation:- Effects of flaxseed oil and olive oil differentiated and mineral oil was Effects of flaxseed oil and olive oil differentiated and mineral oil was assessed in fifty adult haemodialysis patients with stopping up. Starting measurements of oils were 4 mL/day and adjusted differing over the four-week study; 82% of patients on flaxseed oil need changes (typical final dose, 6.9 ± 2.7 mL/day) related to 69% and 53% for olive and mineral oils, independently. Rome III counts amended in a general sense with all three oil prescriptions ($P > 0.01$ for each). Flaxseed oil produced an enhancement in the repeat and consistency of stools; however, mineral and olive oils enhanced counts in five of the six total constipation symptoms. Diabetic nephropathy, hypertensive nephrosclerosis, glomerulonephritis, and polycystic kidney illness were the standard etiologies that incited chronic kidney disease. in fifty adult haemodialysis patients with stopping up. Starting measurements of oils were 4 mL/day and adjusted differing over the four-week study; 82% of patients on flaxseed oil need changes (typical final dose, 6.9 ± 2.7 mL/day) related to 69% and 53% for olive and mineral oils, independently. Rome III counts amended in a general sense with all three oil prescriptions ($P > 0.01$ for each). Flaxseed oil produced an enhancement in the repeat and consistency of stools; however, mineral and olive oils enhanced counts in five of the six total constipation symptoms. Diabetic nephropathy, hypertensive nephrosclerosis, glomerulonephritis, and polycystic kidney illness were the standard etiologies that incited chronic kidney disease.

Dermatology: Oral ingestion with flaxseed oil may recover skin hydration and decrease affectability.

Dyslipidemia: Different animal evaluations have been performed, indicating decreased atherosclerotic wounds, reduced platelet combination, lessened total and LDL cholesterol (LDL-C), and extension of the QT length. Experiments analyzing the activity of flaxseed in stroke expectations in creatures are inadequate [38, 52, 71]. Be that as it may, the accessibility of clinical preliminary and epidemiological information makes proof from creature concentrates less pertinent.

Side effects :- Flaxseed and flaxseed oil supplements appear to be very much endured in restricted sums. Scarcely any symptoms have been accounted for; for example, stay away from flaxseed and flaxseed oil through gestation have delicate hormonal responses. There are barely any investigations of flaxseed just as security in people, for example, supplements do have all the earmarks of being very much endured in the accessible exploration, and there is long-standing verifiable utilization of flaxseed items without numerous reports of symptoms and there's little dependable data on whether it's sheltered to utilize flaxseed when nursing. It ought not to eat crude or unripe flaxseeds, which may contain conceivably poisonous mixes. It might build blood levels of cyanide, a harmful concoction; however, this impact has not been accounted for when enhancements are taken at suggested dosages. Flaxseed, similar to any fibre supplement, ought to be consumed with a great deal of water, as it might compound hindrance or, in extraordinary cases, cause an intestinal jam. Both oil and seed can cause detachment of the entrails. Make an effort not to apply seed or oil to open wounds or injured skin. Considering animal analyses, the excess dose of flaxseed may cause shortening of breath, quick breathing, inadequacy, or inconvenient walking

, and may cause seizures or loss of motion. Hypothetically, flaxseed (not flaxseed oil) may build the danger to the cell from a response termed oxidative pressure. A few examinations report clashing outcomes around there. Because of one



assessment, seed or oil taken by mouth may cause cra–iness or hypomania in people with bipolar problems. On a fundamental level, the diuretic effects of flaxseed (not flaxseed oil) may cause free insides, an extended number of strong releases, and stomach trouble. Diuretic impacts are represented in a couple of examinations of people taking flaxseed or omega-3 acids. Individuals with the runs, crabby inside disorder, diverticulitis, or provocative gut illness ought to keep away from flaxseed because of its conceivable diuretic impacts. Sickness, regurgitating, and stomach torment are accounted for in two people, not long in the wake of taking seed-made things by mouth; these responses may be due to allergic responses. A great deal of flaxseed by mouth may make the digestive tracts quite moving (ileus). Individuals with narrowing of the throat or digestive tract, ileus, or gut hindrance ought to maintain a strategic distance from flaxseed (not flaxseed oil). Flaxseed and flaxseed oil gives off an impression of being all around endured, with not many antagonistic responses typically identified with flaxseed hypersensitivity. Flaxseed-incited hypersensitivity has additionally been accounted for.

Interaction :- The utilization of flaxseed (not flaxseed oil) may diminish the retention of co-administered oral drugs/nutrients/minerals. Oral medications ought to be taken an hour before or 2 hours after flaxseed to forestall diminished ingestion.

Anticoagulant ,Antiplatelet Agents , NSAID'S :- In light of preliminary proof of diminished platelet aggregation [40z, and expanded draining time, flaxseed may- build the danger of draining when taken with enemies of coagulants or antiplatelet drugs. Notwithstanding, no clinical cases are accounted for inaccessible writing.

Antihyperlipidemic Agent :- In principle, flaxseed may act additively with different operators that lower serum lipid levels, Flaxseed and flaxseed oil have been shown to have lipid-bringing down properties in vitro in animals. Various low-quality human examinations have regulated flaxseed items and estimated consequences for lipids, with blended outcomes [30, 57, 58, 61, 66, 67, 72z. Defatted flaxseed (proportionate to the fibre aspect of flaxseed) can essentially reduce all-out cholesterol and LDL levels.

Antihypertensive medications: In principle, flaxseed may potentiate the circulatory strain bringing down the impacts of antihypertensive operators. Starter evidence indicates that higher linolenic acid levels in human fat tissues could be associated with lower blood pressure [95z. Since flaxseed contains ALA, it has been suggested that flaxseed may bring down circulatory strain. Flaxseed- enhanced weight control plans have affected circulatory strain in rodents [33, 96z. Proof from one low-quality human examination recommends that fourteen days of flaxseed supplementation brings down blood pressure.

Laxatives :- Intestinal medicines and stool conditioners may increment or improve the diuretic impacts of flaxseed [88z. **Mind-set stabili–ers, lithium (flaxseed and flaxseed oil):** In light of one investigation, utili–ation of flaxseed may expand scenes of madness and hypomania in bipolar patients [41z. **Oral preventative pills, hormone substitution treatment.** A rich source of plant lignans [98 – 102z is flaxseed (not flaxseed oil). Lignans are also referred to as phytoestrogens and may have adverse or agonist properties of the oestrogen receptor [29z, with ha–y cooperations with oral preventative operators or hormone substitution treatments. The aromatase, 5-alpha-reductase, and 17-beta- hydroxysteroid dehydrogenase activity can be repressed by enterolactone and enterodiols (used from flaxseed in the gut) [52z. It has also been shown that lignans increase the production of sex hormone-restricting globulin [52z. Flaxseed has been shown to decrease serum 17-bet–estradiol and estrone sulphate levels altogether in humans and to raise prolactin levels [52z, the urinary proportion of the two oestrogen metabolites 2-hydroxy estrogen and 16-alpha-hydroxy estrone [38z, urinary discharge of enterodiols and enterolactone [71z, and faecal discharge of enterodiols, enterolactone, and matairesinol respectively.

Flaxseed Benefits for Hair :-

The following ingredients can offer specific benefits for your hair:

Omega-3 fatty acids: omega 3 fatty acid provides vitamins, proteins and nutrients to hair and scalp. Omega 3 fatty acid inhibit hair follicle inflammation and help in reducing hair loss. It promotes circulation in the scalp that may effective in hair growth.

Antioxidant : Antioxidant produces by flaxseed is lignans. Lignans may help to suppress or inhibit bacterial growth. Lignans may help in regeneration of hair and reduces hair loss.



B vitamins: Flaxseed is a consistent source of vitamin B. Vitamin b is a group of nutrients that are recognized for making hair stronger and healthier at a more rapid rate.

Fiber: Fiber ⁴ the most significant for the hair health. Fiber is made from some protein it significantly known as keratin. Many hair products in the market are enhanced with added fiber for minimizing hair damage. Fibers are very effective in camouflaging hair loss.

Vitamin E: Vitamin E is antioxidant is readily available in flaxseed and is vital for hair growth. Vitamin E blocks erosion on scalp tissues and preventing hair loss. Vitamin E is best known vitamin for hair growth. Vitamin E stops hair fall and provides nourishment to hair. VitaminE help to maintain a healthy hair.



Fig 2. Flaxseed



Fig 3. Benefits of Flaxseed

II. LITERATURE REVIEW

1. J Homeop Ayur Med et al., (2013)

Herbal medicines are now in great demand in the developing world for primary health care not because they are inexpensive but also for better culture acceptability, better compatibility in the human body and minimal side effects.



2. Matthew C. Fadus et al., (2017)

Herbal products are complex mixture of organic chemicals that may come from any raw or processed part of a plant, include leaves, stem, flower, root and seed

3. Jhilam Pramanik et al., (2023)

Nutritional profile of flaxseeds (especially mucilage, lignins, dietary fibers, ALA, DHA, EPA, and peptides) is responsible for the functional and nutraceutical properties.

4. Kunal Sahu et al., (2024)

Flaxseed works well as a natural hair smoothing agent, giving hair strength, shining, and hydration. Antioxidants, fiber and omega-3 fatty acids all together to protect and nourish hair. Flaxseed is a wonderful supplement to any hair care regimen overall.

5. Ashleyhubbard et al., (2021)

Flaxseed gel and oil may have many benefits for your hair, such as reducing frizz, helping it grow stronger, and keeping it hydrated.

6. Mukta Agarwal et al., (2021)

Propyl paraben is a stable, non volatile compound used as an antimicrobial preservative in food, drug and cosmetics for over 50 years. It is an ester of p – hydroxybenzoate.

7. Vivek Borse et al., (2013)

The use of specific solvent and co- solvent play vital role towards the success of extraction and sometimes these solvents also possess additive properties; glycol and glycerin are among such type of solvent which employed hugely in herbal industry for their addition benefit.

8. D. Nilesh et al., (2018)

Carbopol is an acrylic polymer. Carbopol is non toxic and non irritating so that it is suitable for gel preparation. Carbopol 934 is often used as a gelling agent in gel preparation.

9. Gerhard whitworth R.N. et al., (2019)

Although used for centuries in nutrition and complementary health practices, flaxseed has created buzz for a whole other purpose: your hair. Whether you apply flaxseed topically as an oil, or perhaps eat more ground flaxseed on a regular basis, there's a belief that doing so will make your hair stronger for better growth and overall manageability. While research is slim, there's no doubt that ground flaxseed and flaxseed oil offer numerous potential health benefits.

10. Dr. Divya Chauhan et al., (2024)

The benefits of flaxseed for hair and overall well-being are many. This humble seed, also known as linseed in India, has a rich history that spans back thousands of years. Celebrated as both a food and fiber crop, this small, brown, nutty-flavored seed is a part of modern diets due to its impressive nutritional profile and potential health benefits. Packed with essential omega-3 fatty acids, lignans, and fiber, flaxseed is being hailed as an ancient superfood. Along with adding a nutritional punch to your dishes, it has promising benefits for hair growth. Let's explore them further.

III. AIM AND OBJECTIVE

Aim :-

Formulation and evaluation of flaxseed mucilage based hair gel.

Objective :-

- To prepare hair gel from Flaxseed mucilage
- To evaluate hair gel
- To check Antioxidant capacity of gel

Need of Study :

1. Studying the safety and efficacy of flaxseed gel .
2. Flaxseed gel is important to understand its potential benefits and possible side effects



3. Gel is applied in hair care.
4. Medicinal plant are rich in several potential drug and it hold healthier and harmless alternative that is mostly seen with synthetic drug.
5. Flaxseeds have good Antioxidant property.
6. From various plant studies it is concluded that the effectiveness and safety of flaxseed gel to other hair care products, including commercial gels and natural alternatives.
7. Research can provide evidence to support claims about the benefits of flaxseed gel, such as its ability to improve hair texture, reduce frizz, and promote hair growth.
8. Studies could investigate potential allergens, side effects, and interactions with other hair care products.

Plant / Drug profile :-

1) Methyl paraben

Methyl paraben is an antifungal spent oftendityofstar

It is also used as a food preservative and has the Ember 1218

Methyl paraben is commonly used as a fungicides in Drosophila food material.

2) Propylene glycol: Propylene glycol is a viscous, colorless liquid, which is nearly odorless but possess a family sweet In general, glycol are non irritating and have very low volatility

A highly effective humectant, propylene glycol help the skin and their aboors and their resain moisture. It also absorb excess water in formula, reducing in bacterial growth to help your product last longer. In hair care products, it soften the hair and makes it easy to comb through.

3) Propyl paraben: Propyl paraben is stable, non volatile compound used as an antimicrobial preservative in food, drug and cosmetics. Propyl paraben is readily absorbed via the gastrointestinal track and dermis Propyl paraben is not carcinogenic and mutagenic

4) Glycerin: Glycerin is thick and gelatinous liquid, may be obtained by fermenting sugar or can also be synthesized by chemical process. Glycerin extensively employed in cosmetics and herbal industry. Glycerin act as humectant, help skin to remain moistened and protect form excessive dryness

Glycerin also boosts strength of hair by facilitating moisture content into hair root plant glycerin offer solvent properties like water alaphytic alcohol.

Therapeutic use of glycerin:

- Reduce pressure in the eye.
- Reduce brain swelling caused by brain hemorrhage.
- It is used in the treatment of trigeminal neuralgia.
- It is used to relief constipation.

5) Triethanolamine: Triethanolamine is a compound with slight ammonia smell; think of hair dyes. The thick, colourless liquid help reduce the surface tension of product. It also help to mix oil and water based product to create a smooth, stable formulation.

It has the potential to trigger scalp irritation and harm the hairs keratin which is a key component if hair and ultimately leading to brittle and dry hair.

6) Carbopol 940: Carbopol is an acrylic polymer. Carbopol is non-toxic and non-irritating so that it is for gel preparation. Carbopol 940 is often used as a gelling agent need to be concerned to obtain a good gel preparation.

7) Distilled water: Distilled water has a PH of about 4.5-5 which is close to the skin pH. Hence distilled water is effectively used in many skin care and hair care and hair products.

Water constituents almost 65-70% in the cosmetics products, hence it is very important that the best quality of water is used in cosmetics product, so as to avoid any kind of Allergic reaction in your body As distilled water is devoid of any toxins, salt and mineral, it is mostly preferred in the cosmetics industry.



8) Rose oil: It is obtained from rose damasena, R. Centifolia, family Rosaceae. Oil is colourless or yellow liquid with characteristic odour. Rose oil obtained is used mainly in perfume. Rose water is also used in many facial and skin treatment.

Its therapeutic application is treatment of anxiety, depression, headache, menopause and migraine.

PLAN OF WORK

- 1) Literature review
- 2) Select herbal plant
- 3) Extraction of flaxseed mucilage
- 4) Formulation of gel
- Evaluation test
- a) Physical evaluation
- b) PH
- c) Homogeneity
- d) Washability
- e) Spreadability
- 5) Result
- 6) Summary
- 7) Discussion
- 8) Conclusion

IV. EXPERIMENTAL WORK

Material and Method : Selection of plant :



Fig . 04

Organic Tattva, Organic Flax Seeds (ALSI) Quality Raw Unroasted Seeds, No Artificial Additives Or Harmful Pesticides Enriched with Omega-3, Heart-Healthy (100G, Pouch)

Extraction process :-

- 1) The aqueous extract of flaxseed was prepared by adding flaxseeds to boiling water (ratio – 1:10).
- 2) Boil it for 15 min with constant stirring until thick mucilage was obtained.
- 3) Then the mucilage was strained by using muscaline cloth and store at room temperature until further use





Fig .05 Extraction of Flaxseed Mucilage (Boiling)



Fig .06 Extraction of Flaxseed Mucilage (filtration)

FORMULATION OF GEL

- 1) PEG ,glycerin and methyl paraben are dissolved in 20ml (250 ml beaker) stirring using mechanical stirrer
- 2) 2gm carbopol and PVP added slowly to bealer containing above mixture of liquid with continuous stirring.
- 3) Then triethanolamine was added slowly with continuous stirring until gel structure was obtained.
- 4) Finally add 20 % flaxseed extract in carbopol gel formulation
- 5) The prepared herbal gel formulation were stored at room temperature until further evaluation

EVALUATION TEST :-

- 1) Physical evaluation :-

The physical appearance was visually checked for the appearance, colour and the feel on application of prepared hair gel formulations. The results are shown following table.

COLOUR :-

Different formulation of various concentration of hair gel were observed for colour by visual observation.



| Formulation | Colour |
|-------------|-------------|
| F1 | White |
| F2 | Pale yellow |
| F3 | Pale yellow |

2) pH Determination

The pH of all hair gel formulations were determined by using the digital pH meter¹¹. One gram of gel was dissolved in 100 ml distilled water and stored for two hours. Electrodes were completely dipped into the hair gel formulations and pH was noted. The measurement of pH of each formulation was done in triplicate and average values were calculated. The results are presented in table.

| Formulation | PH |
|-------------|------|
| F1 | 6.5 |
| F2 | 6.72 |
| F3 | 7.4 |

3) HOMOGENICITY :-

All three formulation were tested for homogeneity for visual observation.

| Formulation | Homogeneity |
|-------------|----------------|
| F1 | Poor |
| F2 | Good |
| F3 | Lums formation |

4. SPREADABILITY :-

The spreadability of hair gel formulation was determined by spreading diameter of 1 gm of gel between two horizontal plates.



F1 :- 12.2 cm / sec.



F2 :- 10.8cm /sec



F3 :- 9.6 cm / sec.

Fig . 07 Evaluation of Gel (spreadability)



V. RESULT

Phytochemicals parameters :-

Phytochemicals parameters of gel includes colour , appearance , pH , Homogeneity , Spreadability , washability are include in table the results are as follows.

| Formulation sample | F1 | F2 | F3 |
|--------------------|-----------------|--------------|----------------|
| Color | White | Pale yellow | Pale yellow |
| Appearance | Translucent | Transparent | Translucent |
| pH | 6.52 | 6.72 | 7.4 |
| Homogeneity | Poor | Good | Lums formation |
| Washability | Easily washable | Non washable | Washable |
| Spreadability | 12.2cm /sec | 10.8cm/sec | 9.6cm/sec |

Summary :-

The present study aimed to formulate a natural hair gel using mucilage extracted from flaxseeds (*Linum usitatissimum*) and to evaluate its physicochemical properties, , and The mucilage was extracted through a boiling and filtration process and subsequently incorporated into gel formulations.

The formulated hair gel was evaluated for parameters such as pH, spreadability, appearance, and. Washability .

The flaxseed mucilage gel demonstrated ideal pH levels compatible with scalp and hair. F2 good Homogeneity and Spreadability, moderate hold, and minimal flaking. Its natural composition, moisturizing properties, and biodegradability highlight its potential as a safe, eco-friendly alternative to synthetic hair gels.

Discussion :-

The findings from this study indicate that flaxseed mucilage possesses significant potential as a gelling agent in hair cosmetic formulations. Its natural polysaccharide content contributed to effective film formation and hold properties, albeit less stiff than synthetic polymers.

The pH of the final product (~6.5 -7.5) aligned well with the scalp's natural pH, reducing the risk of irritation. The viscosity of the gel was within desirable limits, ensuring good spreadability and ease of application.

In conclusion, flaxseed mucilage hair gel is a viable alternative to synthetic hair gels for consumers seeking natural, gentle, and environmentally friendly hair care solutions. Further research on large-scale production, consumer preference, and long-term storage stability will support its commercial potential.

VI. CONCLUSION

The formulation and evaluation of flaxseed mucilage-based hair gel demonstrated that flaxseed is a promising natural source for developing eco-friendly and effective hair styling products. The mucilage extracted from flaxseeds provided good gelling properties, moderate hold, and excellent spreadability, making it suitable for daily hair care applications.

The final formulation exhibited a pH compatible with the scalp, Homogeneity viscosity, minimal flaking, and good user acceptability. Its natural origin, along with the potential for moisturizing and nourishing the scalp, makes it a safer alternative to conventional synthetic hair gels that often contain harsh chemicals.

The formulation of flaxseed hair gel provides a good base for treating the scalp and strengthen the hair thereby preventing the hair fall. There is further scope for pharmacological and further studies.

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