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Review Article

Review On Formulation And Evaluation Of Ayurvedic Tooth Gel

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ABSTRACT

A recent shift of preference towards Ayurvedic ingredients is visible in oral process increasing the demand for commercially available oral care products containing natural ingredients. Several synthetic drugs have been evaluated over the years for their antimicrobial effect in oral cavity; however, all are associated with numerous side effects that prohibit their regular long-term use. Natural remedies are more acceptable in the belief that they are safer with fewer side effects than the synthetic ones. Therefore, the objective of the current research was to formulate, characterize and evaluate a gel-based dental which is more stable in terms of rheological behavior, long term protection and stability in diverse conditions with minimum adverse effects. The aim of this work is to formulate and evaluate an Ayurvedic tooth gel by using natural ingredients such as cow dung ash, turmeric, clove oil, honey, charcoal, linseed and eucalyptus oil. These ingredients are available in market in wide range. Hence modern methods focusing on these aspects are useful for the standardization of herbs and their formulations. Consumers believed by using Ayurvedic based tooth gel are safe, effective and less toxic.

INTRODUCTION

Gels are homogeneous, semi-solid preparation used to cure and prevent skin conditions. Due to the hydrophilic nature of gels, the medicine or active components was released quickly.

Structure of Gel:

A gel consists of a natural or synthetic polymer forming a three-dimensional matrix throughout a dispersion medium or hydrophilic liquid. As soon as the liquid is applied, it evaporates, leaving the medication contained in a thin layer of the gel-forming matrix that physically covers the skin. The flexibility of a gel is caused by the existence of a

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network created by the interlocking of gelling agent particles. The composition of the particles and the kind of forming network that creates the links influence the network's structure and the gel's properties.[4]

Ideal Characteristics of Gels:

Swelling:

Gels have the ability to swell, absorbing liquid while expanding in size. This might be viewed as the beginning of the disintegration process. Gel-gel interactions are replaced by gel-solvent interactions as a result of solvent permeating the gel matrix. Normal cross-linking in the gel matrix, which inhibits complete disintegration, causes limited swelling. When the solvent combination has a solubility characteristic similar to that of the gellant, this gel swells significantly.

Syneresis:

Upon standing, many gel systems shrink. The interstitial liquid is expressed and accumulates on the gel's surface. This method, known as syneresis, has also been seen in organogel and inorganic hydrogels in addition to organic hydrogels. Syneresis often intensifies with lowering polymer concentration.

Ageing:

Slow spontaneous aggregation is a typical feature of colloidal systems. Ageing is a term that describes this process. Ageing induces a thick network of the gelling ingredient to gradually accumulate in gels. Since the fluid medium is lost from the freshly created gel, the timer infers that this process is identical to the first gelling process and continues after the initial gelation.

Structure:

The network developed by the interlinking of the gelling agent particles is what gives a gel its flexibility. The characteristics of the gel and the network's structure depend on the kind of particles used and the force used to create the links.

Rheology:

Solutions of the gelling agents and flocculated solid dispersion display nonnewtonian flow characteristics, which is defined by a drop in viscosity with an increase in shear rate, and are hence considered pseudoplasticity, or pseudoplastic solutions. By breaking down interparticle attachment, the fragile structure of inorganic particles distributed in water is disturbed and exhibits a stronger inclination to flow when shear force is applied. Similar to this, when shear stress is applied to macromolecules, the molecules align in the direction of the tension.[4]

Ideal Properties of topical gel:

- The gel should be clear and homogenous.
- The gel should be inert in nature.
- The gel should be non-sticky.
- The gel should not interact with any other formulation component.
- The gel should be stable.
- It should be non-irritate to the skin or any part where the gel is applied.
- The viscosity should be optimum.
- It should have anti- microbial activity.[5]

Method of preparation of Gel:

There are 3 methods for preparation of gels:

1. Fusion method

In this method the vehicles, gelling agents, additives and drug are blended at high temperature until a semi solid texture was not formed.

2. Cold method

In this method all the component exclude drug or active pharmaceutical ingredient is heated and blended simultaneously and then lower the temperature of formulation, then add drug and again blending was started until the gel was not formed.

3. Dispersion method

In this method the gelling agent is stirred with water until the gelling agent is swell up and then drug is dissolved in medium and incorporated into it. Add buffer solution to adjust the pH of the gel if necessary.[5] Ayurvedic Tooth gel are defined



as “Semi- inflexible system in which movement of dispersing medium is confined using on interlacing 3-dimensional network of particles from different herbs or solvated macromolecules of the dispersed phase which is applied for tooth cleaning”. Ayurvedic gel have better ability as a vehicle to manage drug topically in comparison to ointment .They are non-sticky and require less energy during formulation and have aesthetic value. Ayurvedic gel have several benefits over traditional gel. The oral cavity is similar to other sections of the digestive tract in having a natural resident microflora that benefits the host by acting as part of the host defences and preventing colonization by exogenous (and often pathogenic) bacteria. Inadequate oral hygiene may lead to bacterial colonization causing periodontal diseases such as gingivitis, a condition which usually causes little or no discomfort(1). Cow dung ash has many beneficial implications in agriculture, organic farming as good quality natural manure and biopesticides, as alternate energy resources and high medicinal values. In this Ayurvedic tooth gel cow dung ash is used as abrasive(7). Clove oil is one such product exhibiting multiple benefits and has gained considerable importance in clinical research. Since clove oil shows low intrinsic toxicity along with a wide spectrum of biological actions like analgesic, antiseptic, antispasmodic, anti-neuralgic, carminative, anti-infectious, disinfectant, insecticide, stimulant, stomachic and other useful properties(8) .Eucalyptus oi is used for the treatment of gum diseases as anti-plaque agent for bleeding gums for halitosis Stomatitis(9).Linseed gum exhibits emulsifying and foaming activities or can be used as a thickening and gelling agent[10].In this Ayurvedic tooth gel Turmeric is used as a coloring agent as well as antimicrobial agent(11).In this tooth gel honey is used as sweetening agent and as preservative.[8] The purpose of this research is to create a novel herbal tooth gel for the treatment of

gingival bleeding and toothache. For a long time, people have relied on herbal medicine's healing abilities towards off and treat a variety of dental maladies. Insufficient research and historical understanding of the role of medicine in dental illness is the primary issue. The World Health Organization reports that 80 percent of the global population uses traditional medicine (herbal) to address their basic medical needs. This is likely due to the accessibility, affordability, and cultural acceptability of these plant extracts. The development of indigenous treatments and the use of herbal medicines to treat a wide range of conditions both contribute to a healthier economy. There may be variations in efficacy across herbal medicines, so it's vital to pick wisely. The main goal of treating gingivitis is to reduce inflammation. For this purpose, a number of tools are used to scrape away tartar and plaque from teeth(12).

Objective:

- To formulate and evaluate the tooth gel.
- To perform gel characterization.
- To develop dental or tooth gel for the treatment of periodontal disease.
- To prepare tooth gel by using various types of herbal substances.
- To evaluate the tooth gel with the use of various evaluation parameter.

Benefits:

- a. Herbal drugs have long era of use and better patient tolerance as well as public acceptance.
- b. Herbal drugs act as a renewable source, which is our only hope for population.
- c. The cultivation and processing of medicinal herbs and herbal products is environment-friendly.
- d. Throughout the world, herbal medicine has provided many of the most useful and vast variety of drugs to the modern medical science.[8]

Preformulation Study:



- Morphology activity
- Microscopic characteristic
- Physiochemical characteristics of cow dung ash.[8]

There is no evidence, though, that it has any effect on stains below a tooth's enamel, or that it has a natural whitening effect (14).

Ayurvedic Tooth Gel Evaluation Parameters:

1. Appearance:

All the formulations of Ayurvedic tooth gel were pale yellow in colour.

2. Consistency:

The consistency was checked by applying on skin.

3. Greasiness:

The greasiness was assisted by the application on to the skin.

4. Determination of pH:

pH of gel was determined using digital pH meter by dipping the glass electrode completely into the gel system.

5. Determination of viscosity:

Viscosities of the formulated gels was determined using Brooke field viscometer, spindle no. 7 and spindle speed 60 rpm at 25-C was used gels, the

- Identification Test

corresponding dial reading on the viscometer was noted.

6. Determination of spread ability:

Spread ability was determined using following formula,

$$S=M.L/T$$

Where,

S is the spread ability in grams.cm/sec.

M is the mass in grams,

T is the time in seconds.



7. Determination of extrudability:


It was determined by sign a tube filled with the gel having a tip of sim opening and by measuring the amount of gel that extruded through the tip when a pressure was applied on the tube was noted down.








8. Stability Study:






Physical stability study tests of the formulation were carried for one weeks at temperature of 37°C.Theformulation was found to be physically stable at temperatures of 37°C. Within one weeks'1 were pale yellow in colour(8) .

Table No.1: There are different types of Ayurvedic plant which are used in preparation of Ayurvedic gel which are as follows:

Sr. No	Plant Name	Used part of plant	Extraction Method	Chemical Constituents	Medicinal Uses	Figure
1.	Clove oil [15,16,19]	Leaves	Steam Distillation	Eugenol ,carvacrol, eugenyl acetate,thymol, cinnamaldehyde , caryopjyllene ,2- heptanone	To treat toothaches, clove oil has long been added directly to the gums	
2.	Lavender oil [15]	Flower spikes	Steam Distillation	Linalool,linalyl acetate,1,8-cineole,B-ocimene,terpine n-4-ol,1-fenchone,viridiflorol &camphor	Used to reduces bacteria,relieve pain,soothe inflammation	

3.	Cinnamon oil [15]	Bark or leaves	Hydro Distillation	Trns-cinnamaldehyde, eugenol & linalool	In treating oral candidiasis, used against the action of oral pathogens involved in dental carries.	
4.	Eucalyptus oil [15]	Dried eucalyptus leaf	Maceration	1,8-cineole, cryptone, p-cymene, trans-pinocraeol, phellandral, cuminal, globulol, limonene	Control of gum disease as an anti-plaque component for gum bleeding	
5.	Lemon oil [15]	Lemon grass oil	Scarification Method	Terpenes, d-limonene and l-limonene	Lemon oil can help prevent receding gums and tooth decay by fighting against bacteria	
6.	Tea tree oil [15]	Leaves	Steam Distillation	Terpinen-4-ol, p-cymene, 1,8-cineole	Used in oral hygiene and oral candidiasis prophylactic drugs	
7.	Ylang - Ylang [15]	Flowers	Steam Distillation	Geranyl acetate, linalol, geraniol, farnesol, benzyl acetate, geranial, methyl chavicol	Useful in periodontal disease	
8.	Coconut oil [15]	Coconut meat	Boiling, Fermentation, Refrigeration, Centrifugation & Enzymatic separation	Fatty acid, caprylic acid, capric acid, lauric acid, palmitic acid, stearic acid, oleic acid	Decrease plaque build-up, avoid tooth loss and prevent gum disease	
9.	Spearmint oil [15]	Leaves	Steam Distillation	Carvone, cis-carveol, limonene, 1,8-cineol, cis-dihydrocarvone, carvyl acetate.	Help soothe toothaches	

10	Guava leaf[16,17]	Leaves	Cold maceration technique	Tannins,terpenes,flavonoid,guajanoic acid,saponins,carotenoids,lectins ellagic acid uvaol	Antibacterial activity,antifungal,antiulcer,antimicrobial	
11	Turmeric[17,19]	Rhizomes	Cold maceration technique	Curcumin,demethoxycurcumin,euugenol,tannins,alkaloids,saponins,terpenoids and curcumol .	Anti-inflammatory agent, antimutagenic, virucidal ,antioxidant and anti -ulcer	
12	Glycyrrhiza Glabra [18,19]	Roots	Maceration	Glycyrrhizin, glycyrrhetic acid, isoliquiritin , isoflavones.	Antibacterial, Sweetner in pharmaceuticals.	
13	Neem[18]	Leaves	Maceration	Terpenoids like nimbin nimbinin ,nimbolide & nimbidin .	Antimicrobial Anti-plaque,Prevent dental carries and periodontitis	
14	Aloe vera gel[20]	Leaves	Scraping	Aloin, aloeresin,emodin,aloe-emodin,acemaman	Wound healing effect,gingivitis,plaque control,curing oral mucosal lesions, antibacterial	
15	Vitex negundo [21]	Leaves	Soxhlet Extraction	Casticin, orientin, isoorientin, liteolin,corymbosin alkaloid andterpenoids.	Anti-arthritic activity, Analgesic, Vasodepressant, Anti-malarial activity	
16	Cardiospermum halicacabum[21]	Leaves	Soxhlet extraction	Arachidic acid,apigenin,apigenin-7-O-glucuronide,chr ysoeriol-7-O-glucuronide,lute	Anti-arthritic activity, Antipyretic, Anti-inflammatory,	

				olin-7-O-glucuronide	Anti-convulsant.	
17	Terminalia Chebula Retz.,[22]	Leaves	Steam distillation	Steroids, flavonoids, tannins,belleric acid, bellericoside, chebulinic acid, gallic acid,ethyl gallate, punicalagin,terfl avin A ,Terchebin, Luteolin and tannic acid.	Antiinflammat ory , Antibacterial , Antifungal, Analgesic , Sun burns and Wound healing .	
18	Hibiscus Rosa Sinesis[23]	Flower	Steam Distillation	Flavonoids,tanni ns,reducing sugar,mucilage, anthocynin pigment, cyanodindigluco sides,carotene,th iamine,riboflavi n,niacin &ascorbic acid	Antifertility, abortifacient, antiestrogenic, analgesic, anti- inflammatory	
19	Allum cepa[24]	Fruit	Soxhlet extraction	89% water,1.5% protein,vitamins B1,B2,and C ,potassium, selenium	Anti- inflammatory, Anti- cholesterol, anticancer &Antioxident	
20	Cassia alata linn[25]	Leaves	Soxhlet extraction	Flavones, flavonols,flavon oids glycosides, alatinon,alanona l	Anticancer activity, antidiabetic ,antifungal,anti viral,antiulcer use in skin disorder and wound – healing activity	
21	Cynodon Dactylon[2 6]	Whole parts	Soxhlet extraction	Terpinoids,Vita min-C flavonoids,luteol in,orientin,neox anthin,saponins, volatile oil	Anti – inflammatory, wound healing, anti -Diabetic	

CONCLUSION:

It was concluded that the Ayurvedic tooth gel which are prepared from natural ingredients they show fewer side effects as compared to synthetic tooth gel which are prepared from synthetic compound. The prepared Ayurvedic tooth gel was evaluated using various parameter and was found to be satisfied for the use (27).

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the authors declare that the research was conducted in the absence of any commercial or financial that could be constructed as a potential conflict of interest.

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