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FORMULATION AND EVALUATION OF RICE BRAN OIL INCORPORATED TOOTHPASTE FOR ORAL HYGIENE

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ABSTRACT

Purpose of oral care is the maintenance of a functional and comfortable oral cavity and reduces bacterial activity in the mouth. Toothpaste is a paste to be used with a toothbrush to maintain andimprove oral health and aesthetics. The object of present study involves the preparation of toothpaste containing Rice bran oil as active ingredient for improve oral hygiene and reducing halitosis among the people. The toothpaste was evaluated for following parameters like viscosity, spreadability, abrasiveness and pH. The product passed an evaluation test and was found to be stable.

KEYWORDS: Toothpaste, Rice bran oil, Oral hygiene, formulation.

INTRODUCTION

Oral Hygiene

Oral hygiene is the practice of maintaining the oral cavity free from disease and cleans the cavity and prevents other problems like halitosis by regular brushing and having a good hygiene habits. Poor oral hygiene may leads to disease like halitosis, local infection, inflammation and systemic inflammatory reactions, which are important mediators of development of stroke1. To avoid the problems that occur due to the halitosis can be mostly cured by using rice bran oil as an active ingredient in toothpaste. It is important that oral hygiene should be carried out on a regular basis to enable the prevention of dental disease and bad breath.

Current oral hygiene measures are capable of preventing caries and most dental diseases like halitosis and maintaining oral health. Tooth brushing and dental flossing are the common

methods for dental cleaning. Also by using chewing sugar-free gums, these can act as a salivary stimulant, helps to prevent oral problem. The toothpastes, mouth rinses, gels, and chewing gums, dentifrices are the delivery vehicle by using the mechanical measures for chemotherapeutic supplementation; these can improve the oral hygiene. These are includes anticalculus, antibacterial, cariostatic agents.

Sixty per cent of the elderly are not satisfied with oral health status and function in both urban and rural areas. Women are more prone to this oral health problems than man. The majority of elder subject's widely practiced oral hygiene by using bark of neem and mango tree. In urban areas 90% elderly people are using toothbrush and paste. In rural areas, their usage of toothbrush is comparatively much lower than urbans. Age also played a significant role in oral hygiene practice. With advancing age the use of toothbrush has been declining and rinsing with water is increasing. Tobacco smoking and Alcoholic consumption have been increasing day by day, it also leading to significant oral diseases.

Challenges in Oral Hygiene

Mouth increases risk of respiratory infection. Diabetes with periodontal disease have more difficulty in oral disease shows risk factors with other non-communicable diseases (NCDs), including unhealthy eating habits, smoking, excess sugar consumption and excessive alcohol consumption. Cardiovascular disease and diabetic mellitus are those diseases which occur due to poor oral health. Improved oral hygiene can reduce hemoglobin A1C level in diabetic patients. In addition Poor oral hygiene plays a role in oral cancer. Approximately 90% of systemic disease has links to oral health. People who have periodontal disease double their risk of fatal heart attack. The infection increases risk of respiratory infection.

Common Problems of Oral CavityLocal Infections

- **Halitosis** - it is an oral health problem where the offensive odour of breath.
- **Dental caries** - loss of tooth substance (enamel and dentine) is caused by acid production resulting from bacterial metabolism of sugars and destructive process of decalcification of dentition.
- **Dental plaque** - Dental plaque is a sticky film of bacteria that constantly forms on your teeth or soft thin film of food debris and dead epithelial cells that is deposited in the teeth.
- **Periodontal disease or pyorrhoea** -The pyorrhea, also known as periodontitis, is a multifactorial disease affecting oral gum. It is an inflammation caused by bacteria, which

can affect causing halitosis (bad smell of the mouth) or pus formation

- **Cheilosis** - Cheilosis is swelling and fissuring of the lips cracking or ulceration of the lips and angles of the mouth.
- **Bleeding gums**-The main cause of bleeding gums is the buildup of plaque at the gum line. This will lead to a condition called gingivitis, or inflamed gums.
- **Root abscess**-A root abscess is a pocket of pus that's caused by a bacterial infection. The abscess can occur at different areas near the tooth for different reasons.
- **Stomatitis**-A general term for an inflamed and sore mouth, can disrupt a person's ability to eat, talk, and sleep. Stomatitis can occur anywhere in the mouth, including the inside of the cheeks, gums, tongue, lips, and palate.

Different Types of Oral Hygiene Agents

Toothpaste, Oral irrigators, Teeth whiteners, Mouthwash.

Toothpaste

Choose a toothpaste that contains fluoride to strengthen tooth enamel and prevent tooth decay. Many toothpastes also have ingredients that fight tooth sensitivity, gingivitis (early-stage gum disease), bad breath, or hardened plaque called tartar. Ask your dentist for recommendations on the best toothpaste for your specific oral health needs.

Oral irrigators

This oral hygiene appliance shoots a steady stream of water in your mouth to remove food from hard-to-reach places between and around your teeth. Be sure to look for one that you can regulate so the water pressure isn't too high.

Teeth whiteners

The best way to whiten your teeth is to visit your dentist. Teeth whiteners use peroxide solutions to actually bleach teeth. You can also try an over-the-counter product, such as whitening strips. Chase says these whitening products are good, but won't give the same results as an office treatment because the peroxide solution isn't as strong and the strips aren't customized to fit yourmouth.

Mouthwash

Different mouthwashes tackle different dental problems. Some help reduce plaque and prevent gingivitis; others contain fluoride to help fight cavities. Some can control or mask

bad breath. If you have difficulty brushing and flossing, a mouthwash may provide additional protectionagainst cavities and gum disease.

TOOTHPASTE

Toothpaste is a paste or gel dentifrice with complex composition to be used with a toothbrush to maintain and improve oral health and aesthetics. Since their introduction several thousand years ago, toothpaste formulations have evolved considerably from suspensions of crushed egg shells or ashes to complex formulations with often more than 20 ingredients. Among these can be compounds to combat dental caries, gum disease, malodor, calculus, erosion and dentin hypersensitivity. Furthermore, toothpastes contain abrasives to clean and whiten teeth, flavours for the purpose of breath freshening and dyes for better visual appeal. Effective toothpastes are those that are formulated for maximum bioavailability of their activities. This, however, can be challenging as compromises will have to be made when several different activities are formulated in one phase. Toothpaste development is by no means complete as many challenges and especially the poor oral substantivity of most active ingredients are yet tobe overcome. favours for the purpose of breath freshening and dyes for better visual appeal. Effective toothpastes are those that are formulated for maximum bioavailability of their activities. This, however, can be challenging as compromises will have to be made when several different activities are formulated in one phase. Toothpaste development is by no means complete as many challenges and especially the poor oral substantively of most active ingredientsare yet to overcome.

Ideal Properties

Good abrasive effect, Non irritant and non toxic, Impart no stain in tooth, Keep the mouth fresh and clean, Prolonged effect, cheap and easily available.

Advantages

Improving bad breath, Cleaning and polishing the tooth, Help to prevent tooth and gum disease like gingivitis or tartar build-up, Remove stains from tooth, Reduce incidence of teeth decay, Help to strengthen the enamel that has been attacked by acids, Preventing cavities, Reducing tooth sensitivity, Preventing enamel erosion, Cosmetically improving the appearance of your mouth.

Disadvantages

- Overuse of toothpaste has been identified as actually causing certain conditions such as

thinning of tooth enamel and heightened sensitivity.

- Extended consumption of large volumes of fluoridated toothpaste can result in fluorosis. Fluoridated toothpaste can be either acutely toxic if swallowed in large amounts or chronically toxic if swallowed in any amount consistently.
- Triclosan, an active ingredient in many toothpastes can combine with chlorine in tap water to form chloroform which is a human carcinogen. According to some scientists it can leave unborn babies brain damaged.
- Although in several studies whitening toothpaste shows the ability to improve tooth color they have side effects. The most significant one is enamel and dentin abrasion which in turn leads to increased tooth sensitivity.
- Stiffness, Pain and aching of bones.
- white, brown, or black discoloration of the teeth occurs only during periods of tooth development in children.
- If you were taught that the more you brush your teeth, the whiter they will become, you could be a potential toothpaste abuser.

FORMULATION OF TOOTHPASTE

Practicing good oral hygiene results in the reduction of plaque, caries and gingivitis. Toothpastes improve oral hygiene by enhancing the effect of mechanical scrubbing with a toothbrush and by delivering therapeutic agents to the oral cavity. A typical toothpaste formulation contains a number of ingredients, each with their own purpose and each with the potential to influence the performance and behaviour of the other ingredients in the formulation. These are categorized by purpose and summarized below, along with examples.

Abrasives

Abrasives are the substances that are used for abrading, grinding or polishing. They remove substances adhering to the surface of the teeth without scratching it and bring out their natural luster. One of the major properties of the abrasive is hardness. The degree of abrasivity depends on the hardness of the abrasive, the morphology of the particles, and on the concentration of abrasive in the paste. As the hardness of the enamel on the tooth surface is 6-7 on the Moh's scale, the hardness of an abrasive should be 3 or less. Abrasives are most often found as crystals, small and smooth particles are preferred to avoid tooth wear. Needle and rod-shaped particles must be avoided. The pH of abrasives should range from weakly acidic to weakly alkaline and they should be white powders which are insoluble in water,

flavourless and odourless. The following substances are widely used abrasives, which satisfy these conditions.

Calcium carbonate (CaCO3)

A fine, white, odourless, microcrystalline powder, practically insoluble in water.

a) Calcium phosphate, dibasic; Calcium phosphate, di-basic, dehydrate (CaHPO4, CaHPO4x2H2O)

There is a dihydrate form and an anhydride form. As the anhydride form is harder than the dihydrate form, it is not often used by itself.

b) Silica, silica hydrate (SiO2, SiO2 x nH2O)

The main ingredient of the silica used in abrasives is high purity amorphous silicon dioxide and is very suitable for use in toothpastes containing fluoride because no insoluble salt is formed when it reacts with fluoride.

Binders

Binders are used to prevent the separation of powder and liquid ingredients and give an appropriate degree of viscoelasticity and form to the toothpaste. They can prevent the toothpaste from drying out by binding water. Also, they have an influence on the dispersion, foaming, rinsing and other qualities of the toothpaste in the oral cavity. The most widely used binder at present is sodium carboxym-ethylcellulose (CMC).Carboxymethylcellulose is physiologically inactive, it dissolves in water, it is very compatible with other ingredients, highly stable and relatively low in price. There are many types of CMC having a.

Carrageenan

variety of different characteristics stemming from different degrees of hydroxy group substitution and polymerisation, so it is necessary to select the most appropriate one for the purpose in mind. Other known cellulose derivatives include methylcellulose, hydroxyethyl cellulose and hydroxypropyl cellulose.

Sodium alginate

It consists chiefly of the sodium salt of alginic acid. It is used as a suspending and thickening agent and in the preparation of water-miscible pastes, creams and gels.

A white to yellowish coarse or fine, almost odourless powder with a mucilaginous taste. It is

used as an emulsifying, suspending and thickening agent in formulations of toothpastes, creams and emulsions.

Xanthan Gum

It is a cream-coloured powder. Xanthan gum is used as a stabiliser, binder (thickener), and emulsifier.

Humectants

They prevent loss of water, and subsequent hardening of the paste in the tube or when it is exposed to air. They also provide a creamy texture. These are short-chained polyalco- hols such as glycerol, sorbitol (highly concentrated aqueous solution), propylene glycol and polyethylene glycol.

Solvents

Water is the most common solvent used in toothpaste. It dissolves the ingredients and allows them to be mixed. Alcohol is used in mouth rinses (mouthwashes) as a solvent and taste enhancer.

Foaming Agents

The functions of foaming agents are to disperse the tooth- paste throughout the oral cavity in order to enhance the cleaning effect and, acting as a surfactant, clean away the dirt inside it. Also, by means of their volume of foam, they give a feeling of thickness, and satisfaction. Surfactants having excellent foaming, dispersion, suspension, permeation, cleansing and hard water resistance qualities as well as no toxicity or irritation, are selected for foaming agents. Surfactants lower the surface tension of the liquid environment in the oral cavity so that the substances in the toothpaste/mouthwash can contact the teeth more easily. They penetrate and dissolve plaque. This makes it easier to clean the teeth. Another function of the surfactant is in dispersing the flavours in the toothpaste/mouthwash.

Sodium lauryl sulphate (SLS)

A mixture of sodium alkyl sulphates consisting mainly of sodium dodecyl sulphate. It is a white or pale yellow powder or crystals with a slight characteristic odour. Freely soluble in water; partly soluble in alcohol. It exhibits high affinity for proteins and is a strong denaturing agent. Sodium lauryl sulphate may be irritant to the skin and mucosa.

Flavoring Agents

They get rid of the unpleasant smell and taste of the other raw materials and give a cold, refreshing taste Combinations of water-insoluble essential oils, such as spearmint, peppermint, eucalyptus and menthol are often used as flavoring agents in toothpastes and mouthwashes. The flavouring agents are solubilised anddispersed through the pace or liquid via the surfactant.

Sweeteners

Sweeteners also improve the taste of toothpastes and mouthwashes and give them a mild and sweet taste. The most commonly used sweeteners are sodium saccharin, sorbitol and glycerol. Xylitol is a sweetener that is also claimed to provide anti-caries activity.

Colouring Agents

Most toothpastes and mouthwashes contain colour substances which give them an attractive appearance. The colour-substances are classified by the Colour Index (CI). Published by the Society of Dyers and Colourists and the American Association of Textile Chemists and Colourists, or by a system called the FD&C Colours. Titanium dioxide is often added to toothpastes to give them a white colour.

Preservatives

Preservatives prevent the growth of microorganisms in toothpastes and mouthwashes. Mostly, they include sodium benzoate, methylparaben and ethylparaben.

Pharmaceutical Agents

One or more therapeutic agents are usually added to toothpastes and mouthwashes. Most toothpastes today contain fluorides to prevent caries. Recently there has been a development of different toothpastes with additional purposes, such as stain and calculus removal, and prevention of gingivitis, sensitive teeth and gum problems.

Anticaries Agents

Fluoride

Fluoride is considered to be the most effective caries inhibiting agent, and almost all toothpastes today contain fluoride in one form or the other. The most common form is sodium fluoride (NaF), but mono-fluoro-phosphate (MFP) and stannous fluoride (SnF) are also used. The fluoride amount in toothpaste is usually between 0.10-0.15%. Fluoride is most

beneficial when the mouth is not rinsed with water after tooth brushing. In this way a bigger amount of fluoride isretained in the oral cavity. Toothpastes are the main vehicle for fluoride. The combined therapeutic and cosmetic mouthwashes usually also contain fluoride.

Xylitol

A polyhydric alcohol (polyol) related to the pentose sugar, xylose. White crystals or crystalline powder. Very soluble in water; sparingly soluble in alcohol. It has a sweet taste and produces a cooling sensation in the mouth. Xylitol cannot be fermented by oral microorganisms.

a) Calcium/Phosphate

Calcium and phosphate supplementation in a toothpaste or mouth rinse will increase the concentration of these ions in the oral cavity. In this way they improve remineralisation and increase fluoride uptake.

b) Sodium bicarbonate

Several studies have shown that bicarbonate is one of the salivary components that potentially modifies the formation of caries. It increases the pH in saliva, and in this way creates a hostile environment for the growth of aciduric bacteria. Sodium bicarbonate can also change the virulence of the bacteria that cause tooth decay.

Anti Plaque Agents

Sodium lauryl sulphate It has been shown that the enzymes glucosyltransferase and fructosyltransferase are incorporated in an active form into the pellicle; and by synthesising glucan in situ from sucrose, can provide a surface for colonisation by Streptococcus mutans. These enzymes can be inhibited by SLS. Such inhibition can clearly retard the regrowth of plaque.

Triclosan

Triclosan is a non-ionic chlorinated phenolic agent with antiseptic qualities. Triclosan has broad- spectrum efficacy on Gram-positive and most Gram-negative bacteria. It is also effective against mycobacterium and strictly an aerobic bacteria. The mechanism of its antiseptic action is by acting on the microbial cytoplasmic membrane, inducing leakage of cellular constituents and thereby causing lysis of the microorganisms.

Metal-ions

The most widely used metal-ions in dental preparations are zinc (Zn) and stannous (Sn). These metals have the ability to limit bacterial growth, inhibit plaque formation, inhibit the glycolytic sequence in oral anaerobic bacteria, and to restrict the ability of plaque bacteria to convert ureato ammonia. They can also inhibit some bacterial enzymes.

Chlorhexidine

Chlorhexidine formulations are considered to be the "gold standard" antiplaque mouthwashes due to their prolonged broad spectrum antimicrobial activity and plaque inhibitory potential. The mechanism of action of chlorhexidine is related to a reduction in pellicle formation, alteration of bacterial absorption and/or attachment to teeth, and an alternation of the bacterial cell wall so that lysis occurs. Chlorhexidine is effective against both Gram-positive and Gram-negative bacteria, but has most effect against Gram-positive bacteria.

Zinc-ions

Zinc has an anti-calculus effect due to its anti-plaque properties, but in addition it is thought to influence calculus formation by inhibiting crystal growth.

Whitening Agents

Whitening toothpastes do not lighten the colour of the tooth structure; they simply remove surface stains with abrasives or special chemical or polishing agents, or pre- vent stain formation.

Anti Halitosis AgentsZincions

Bad breath or halitosis originates mainly from the oral cavity. The unpleasant smell is due to the retention of anaerobic, Gram-negative bacteria. These bacteria use sulfur containing amino acids as substrates in their production of volatile sulphur-containing compounds (VSC). VSC have a distinctly unpleasant odour even in low concentrations. Zinc inhibits the production of VSC in the oral cavity by interacting with sulphur in the amino acids or their metabolism.

EVALUATION OF TOOTHPASTE

Physical Examination

- Color- Formulated toothpaste was evaluated for its color. The visually color waschecked.

- Odour- Odour was found by smelling the product.
- Taste- Taste was checked manually by tasting the formulation.

Determination of Spreadability

One gm of commercial toothpaste was placed on the centre of the glass plate and another glass plate is placed over the sample. 1kg weight on top of the glass plates was placed. After 10 min, the weight is removed and the diameter of the paste is measured in centimetre. The experiment was carried out in triplicate.

Formula was used to calculate spreadability:$S=M\times L/T$

Where,

S= Spreadability

M= Weight in the pan (tied to the upper slide)L= Length moved by the glass slide

T=Time (sec) taken to separate the upper slide from the ground slide.

Determination of pH

In 100 ml cleaned beaker, accurately weighed 5 gm of sample was transferred. To this freshly boiled and cooled water was added and stirred well to get a uniform suspension. The pH was determined within 5 min by using a pH meter.

Composition

Toothpaste is not composed of mono or disaccharides such as sucrose or fermentable carbohydrates. All ingredients should comply with the Indian standards.

Homogeneity

The toothpaste shall extrude a homogenous mass from the collapsible tube or any suitable container by applying of normal force at 27±20C. in addition bulk of contents shall extrude from the crimp of container and then rolled it gradually.

Tube inertnes

The toothpaste container shall not produce any corrosion or deterioration in normal storage conditions like heating temperature at 45±20C for ten days. Tube inertness can be examined by cutting the internal surface open and observing whether any sign of deterioration or chemical attack occurred in the container.

Relative Density

Relative density was determine by weight in gram taken in 10 ml formulation and 10 ml distilledwater using RD bottle Evaluation Parameters.

Abrasiveness

Extrude the content 15-20 cm long on the butter paper, repeat the same process for at least ten collapsible tubes. Press with the contents of the entire length with fingertip for the presence of sharp and hard edged abrasive particles. Toothpaste shall not contain such particles.

Foaming Power

The foamability of formulated toothpaste evaluated by taking a small amount of formulationwith water in measuring cylinder initial volume was noted and then shaken for 10 times. Final volume of foam was noted. Determination of froth power by using the formula

Foaming power = V1–V2Where,

V1- Volume in ml of foam with water.V2- Volume in ml of water only.

Determination of lead

The color produced with sample solution containing hydrogen sulfide is compared with standard lead solution.

Determination of arsenic

Yellow color stains produced when arsine gas reacts with mercuric bromide paper. Sample stain is comply with the standard stain.

Determination of fluoride ion

Fluoride ions can be determined using potentiometer containing fluoride ion sensitive electrodes.

Calculation: a graph is plotted on a log scale, taking the concentration of fluoride (x-axis) Vs potential in mV (y-axis). From the calibration curve, the fluoride ion concentration (in mg) of test solution is measured.

fluoride ion concentration (ppm) M = 2a×10000where,

a = mg of fluoride ion calculated from graphM=Mass of sample taken in gram.

Stability test

The toothpaste shall be stable, but not to be deteriorating, ferment and segregate during

normal storage conditions and usage. Stability of toothpaste can be tested when it exposes to 45±20C fora period of 28 days. After storage, no phase separation, fermentation and gassing can be observed. Also exposed to cool conditions such as 50C for 1 hour, no obstruction of extrudable form from the container is observed.

Determination of moisture and volatile matter

Weigh 5 g of sample placed in a porcelain dish containing 6-8 cm in diameter and 2- 4 cm depthin it. Dry the sample in an oven at 1050C.

Calculation % by mass =100 M1 / M M1 - loss of mass (in grams) on drying

M - Mass (in grams) of the material taken for the test.

Moisture content

Toothpaste (10 gm) weighed in a Porcelain dish and dried it in the oven at 105 o C. It was cooled in a desiccator. The loss of weight is recorded as percentage moisture content and calculated by the given formula.

% Moisture = Original sample weight – dry sample weight/ Original sample weight.

Cleaning ability Test

In a small beaker, chocolate and coffee were mixed with hot water and little amount of food colour was added and mixed properly. The baked egg shell and human teeth were stained with this solution for 1 hour. The stained egg shell and human teeth were brushed with the wet toothbrush for 5 to 10 strokes (back and forth motion) and there was no change in colour of stain. After that, small amount of commercial toothpaste placed on toothbrush and the stained egg shell and human teeth were brushed by 5 to 10 strokes and hence the cleaning ability of specific toothpaste is observed. Whole test repeated for formulation1 and formulation2 toothpaste to check their cleaning ability. The results were interrupted as follows: '+++' 95% cleaning ability, '++' 85-95% cleaning ability >85%'cleaning ability.

Fragrance test

It was based on individual observation for its acceptability.5 people were asked for acceptabilityof fragrance and their opinion was taken. And fragrance was evaluated based on the below- described criteria;

A) The fragrance was good, as good as the fragrance of reference toothpaste.
B) The fragrance was not so good but comparable to the reference toothpaste.
C) The fragrance of the toothpaste was poor than the reference toothpaste.

Microbial Study

Modified agar well diffusion method was used to determine the antimicrobial activity of formulation, where nutrient agar plates were seeded with 0.2 ml of 24 h broth culture of S.aureus. After solidifying the agar plates, wells were cut at equal distance in each plate by using a sterile 8 mm borer. The wells of plates were filled with near about 0.5 ml of formulation. The plates were then incubated at 37 oC for 24 h. The antibacterial activity was evaluated bymeasuring zones of inhibition (in cm).

RICE BRAN OIL

Rice oil is also called rice bran oil, it is used in Asian countries like Japan, Korea, China & Thailand. In Japan, it is preferred for its subtle flavor and odor. Rice oil is a minor constituent of rough rice when compared with carbohydrate & protein content. Rice bran is the main source of rice oil. The majority of available bran continues to be used for animal feeds without being extracted for oil. Rice bran is produced from the outer layer of brown rice. It contains high valued proteins, fat and nutritional dietary fiber. It also contains several phytochemical compounds with beneficial therapeutic effects, such as antioxidant, anti-inflammatory, and hypoglycemic. Y-Oryzanol is a potent antioxidant component present in rice bran oil. In recent years, research has focused on the development of new pharmaceutical dosage forms, cosmetic formulation or food products containing biological compounds obtained from rice bran oil to improve health conditions of humans and treatment of diseases.

Extraction Methods

1. Solvent extraction process

Solvent extraction method can be used to recover oil from any materials with low oil content, or for pre-pressed oil cakes in order to obtain high oil content. Solvent extraction recovers more oilthan pressing, in the separation of vegetable oils. The solubility of the solute (oil) in the solvent is an important factor for solvent extraction. The process is economically attractive when large quantities of seeds are processed. This solid- liquid extraction is called

leaching and the soluble components in the solid are diffused to the solvent. Commercial-grade hexane is the solvent of choice throughout the world for economic reasons. It is an excellent oil solvent. However, hexane is the culprit of many complications. It produces poor colour quality RBO and also responsible for air pollution, in addition to other health hazards due to its toxicity. The yield of about 92% oil was obtained from hexane extraction. A RBO was also extracted with isopropanol and hexane at 40oC for 15 min. The hexane extracted almost 40% more oil than the isopropanol, while increasing the temperature up to 120oC, the yield of hexane did not increase isopropanol extracted 25% more RBO than hexane under similar conditions. The organic solvent(usually hexane) used is however, flammable, volatile, toxic and pollutes the environment.

MATERIALS AND METHODS

EXTRACTION OF RICE BRAN OIL

Soxhlet extraction method

Soxhlet extraction is one of the methods to extract rice bran oil. 100 grams of ground rice bran were weighed and equally divided into extraction thimbles. Each thimble was then transferred into Soxhlet extractor. Approximately 300 ml of n-hexane were added to the extraction flask, which were connected to the extractor and condenser. After extraction began, solvent flow rate was manually adjusted to 7 min/cycle. Finally the extraction was complete, n-hexane was removed at 50 C under reduced pressure using a rotary evaporator. The flasks were placed in a desiccator chamber for 1 hour. The obtained Soxhlet oil was weighed and yield was calculated.

METHODOLOGY

Formulation of toothpaste

The formulation can be prepared by initially weighing all the powdered ingredients in a beaker. Then put all the powdered ingredients into mortar for size reduction and uniform mixing. Add mixture of glycerin and water with continuous trituration until a smooth paste is formed. The rice bran oil was added as an active ingredient for good refreshing property. Calcium carbonate acts as abrasives and Gum tragacanth as a thickening agent for these preparations.

Table No: 4.2 Different types of formulations of toothpaste.

SI.NO	INGREDIENTS	F1	F2	F3	F4
1	Rice bran oil	2 ml	2 ml	2 ml	2 ml
2	Chalk powder	4.2 g	4.2 g	4.2 g	4.2 g
3	Calcium carbonate	1.68 g	1.68 g	1.68 g	1.68 g
4	Glycerin	1.4 ml	1.4 ml	2.4 ml	2.4 ml
5	Gum tragacanth	0.2 g	0.144 g	0.144 g	0.2 g
6	Saccharin	0.0069 g	0.0069 g	0.0069 g	0.0069 g
7	Sodium lauryl sulphate	1.2 g	1.2 g	1.2 g	1.2 g
8	Peppermint oil	Qs	Qs	Qs	Qs
9	Purified water	3.31 ml	3.37 ml	2.37 ml	2.31 ml

EVALUATION OF TOOTHPASTE FORMULATION

Abrasiveness Test

The formulated toothpaste was placed on three different clean slides and one drop of distilled water was added on each toothpaste sample. With the help of a cotton swab, each toothpaste sample was rubbed in a back and forth motion for 25 times using a short 1cm stroke. Then carefully the slides were rinsed off and dried with soft tissue paper. Each slide was examined under a dissecting microscope and the amounts of scratches are determined on the surface of the slide.

Determination of Spreadability

One gm of toothpaste was placed on the center of the glass plate and another glass plate was placed over the sample. 1kg weight on top of the glass plates was placed. After 10 min, the weight is removed and the diameter of the paste is measured in centimeter. The experiment was carried out in triplicate.

Determination of pH

In 250 mL beaker 2.0 gm toothpaste was taken and 80 mL of distilled water was added and the solution was stirred well. After 30 mins, the pH of the solution is measured with the help of pH meter. This test was repeatedly done for formulated toothpaste. Buffer tablets of pH 4, 7 and 9 were used to calibrate the pH meter during measurement.

Determination of foaming ability

In a test tube 5 mL of distilled water was taken and followed by 0.5 gm of toothpaste was added. The top of the test tube was covered with cork and the test tube was shaken properly. The nature and stability of the foam thus formed were studied and the height of the foam above the water is measured in centimetre. This test was repeated for the formulation.

Viscosity study

The measurement of viscosity of the prepared toothpaste was done using Brookfield digital viscometer. The viscosity was measured using spindle no.

Washability

The ease of removal of toothpaste applied was examined by washing the applied part with tap water.

Determination of moisture and volatile matter

Weigh 5 g of sample placed in a porcelain dish containing 6-8 cm in diameter and 2- 4 cm depthin it. Dry the sample in an oven at 105℃.

Calculation % by mass =100 M1 / M M1 - loss of mass (in grams) on drying

M - Mass (in grams) of the material taken for the test.

Homogeneity

The toothpaste shall extrude a homogenous mass from the collapsible tube or any suitable container by applying normal force at 27±20C. In addition, bulk of contents shall extrude from the crimp of container and then rolled it gradually.

Stability test

The toothpaste shall be stable, but not to be deteriorating, ferment and segregate during normal storage conditions and usage. Stability of toothpaste can be tested when it exposes to 45±20C fora period of 28 days. After storage, no phase separation, fermentation and gassing can be observed. Also exposed to cool conditions such as 50C for 1 hour, no obstruction of extrudable form from the container is observed.

Extrudability

In this method, the formulated paste was filled in a standard capped collapsible aluminum tube and sealed by crimping to the end. The weights of tubes were recorded. The tubes were placed between two glass slides and were clamped. 500g was placed over the slides and then the capwas removed. The amount of the extruded paste was collected and weighed. The percent of the extruded paste was calculate.

RESULTS AND DISCUSSION

Organoleptic Properties

The evaluation was conducted and noticed that there is no change in organoleptic properties

of formulations as shown in Table.

Table no. 5.1: Organoleptic property.

Si.no	Specification	Limits
1	State	Semi-solid
2	Colour	Whitish-grey
3	Odour	characteristics

Homogeneity

All formulations were in uniform distribution of extracts.

Spreadability Studies

Spreadability is the ability of a cream to spread on skin. In the case of toothpaste it means the ability to spread over the teeth's. Spreadability studies showing that all formulations showed good spread as shown in Table.

Table no 5.2: spreadability studies.

SI.NO	FORMULATION CODE	SPREADABILITY	VISCOSITY	pH
1	F1	9.1	2034	8.2
2	F2	14.3	2734	8.5
3	F3	9.4	3136	9
4	F4	7.2	4127	9.2

Washability

Only f2 and f3 were easily washable, the remaining three formulations were not easily washablecompared to the first two formulations.

Foamability

The foaming power of herbal toothpaste is different in each formulation depending on the concentration of sodium lauryl sulphate. On increasing the concentration of sodium lauryl sulphate, the amount of foam formation is also increasing.

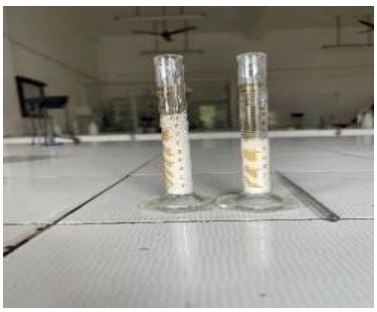

Fig. 5.2: Foaming Power.

Abrasiveness test

The scratches found on slides are different. After examining each 3 slides having different formulations (F1, F2, and F3) under microscope, F3 and F2 show less scratches compared to F1.

Irritancy test

After applying the toothpaste on a specified area, none of the formulations showed signs ofirritancy, erythema or edema.

Dilution test

All the formulations of toothpaste showed good dilution with water except F1 and F2. F3 and F4showed some stable nature in water.

Stability test

The toothpaste shall be stable, but not to be deteriorating, ferment and segregate during normalstorage conditions and usage.

Table no 5.5: Stability Test.

SI.NO	SAMPLE F3 (24C-28C)	pH	VISCOSITY
1	0^{th} day	9	3136.67
2	10^{th} day	8.8	3243.32
3	30^{th} day	8.5	3306.44
4	60^{th} day	8.4	3497.67

CONCLUSION

Cosmetic toothpaste and oral hygiene products are used to care for teeth and mouth. The present study involves formulation, Development and Evaluation of toothpaste and also Extraction of Rice bran oil. Rice bran oil when used in oil pulling was effective in reducing halitosis. It performed comparably and marginally superior to other agents tested in study when change in halitosis post intervention was considered.

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